INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

COLOR FACTS

tomorrow's shopmen must know!

Teach your students how

PITTSBURGH COLOR DYNAMICS

makes production better and safer by separating critical from non-critical parts of machinery.

BESIDES a knowledge of metals, machines and methods, the skilled shopman of tomorrow must know how to use color to turn out better production.

By using Pittsburgh COLOR DYNAMICS he will be able to focus an operator's attention more closely on his task. Use of proper *focal* colors will separate working parts from stationary parts of the machine and from the material being worked on. This reduces eye travel which is one of the causes of eye fatigue. The result of this improved visibility soon makes itself felt in the daily output of the worker—and in his attitude toward his work.

COLOR DYNAMICS also shows the student how to use *morale-building* colors to promote cheerfulness and restrain mental depression and *safety* colors to reduce accidents in the shop.

Begin now to teach your students COLOR DYNAMICS. Write today for a *free* copy of our book which explains how to use this new system for painting. Packed with interesting data and practical suggestions it is an excellent text book. Pittsburgh Plate Glass Company, Pittsburgh 22, Pennsylvania.

Send for this
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Our booklet — "COLOR DYNAMICS IN INDUSTRY" — explains this new painting system and how you can use it in your plant. Mail this coupon for your FREE copy.

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South Bend presents this new 14" Drill Press as a companion to the South Bend Precision Lathe. It is built with the same high standards of accuracy and skilled workmanship. Years of painstaking research and experimentation have gone into its design. This has resulted in a superior tool unsurpassed for accuracy, ease of operation, versatility and dependable performance.

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Quick-acting belt tension release lever simplifies speed changes. Keeps tension correct.

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Provides shielded illumination for work area. Separate on-off switch.

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Free-floating design prevents misalignment, side thrust, and whip. Travel of spindle . . . . . 4"

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Sealed, precision type. No oiling. 2 on spindle drive unit, 2 on spindle.

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Compensates for wear.

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Graduated in inches. Adjustable collars control feed and return.

RUGGEDLY CONSTRUCTED
Precision-built for industrial and all other types of shops.

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Cat. No. 400-B bench type.
Cat. No. 400-F floor type.

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Maximum drill size in iron or steel . . . . . ¾"
Drills to center of 14" circle.

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Capacity . . . . . 0 to ⅝"

SPEEDS
Four — 707 to 4322 r.p.m.

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10" x 10" . . . . Tilt Type

COLUMN
2¾" diameter. Accurately ground.

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Bench Model . . . . 35½"
Floor Model . . . . 65½"

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MOTOR REQUIRED
½ h.p., 1725 r.p.m. Vertical mounting. On-off switch provided.

$98.00 f. o. b. factory, bench model with chuck, extension cord and switch; less motor.
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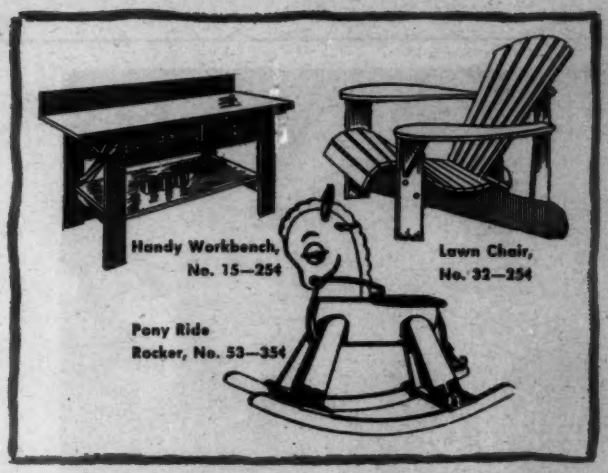

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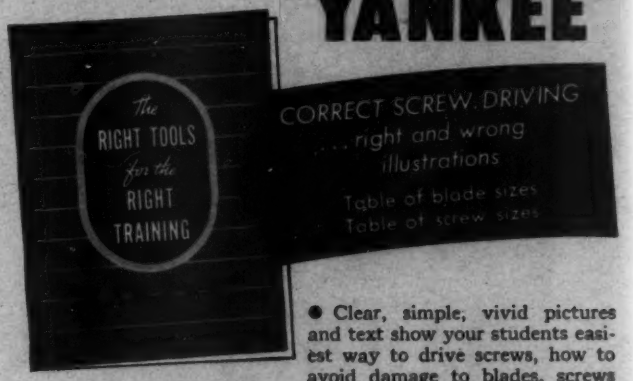
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Table of blade sizes
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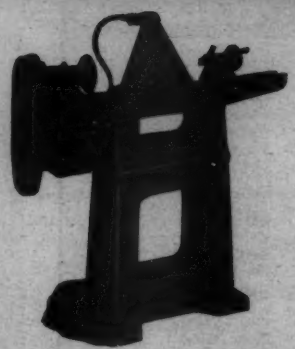

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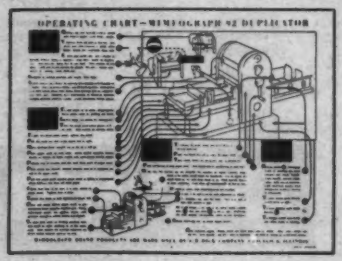

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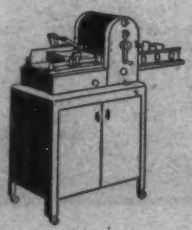

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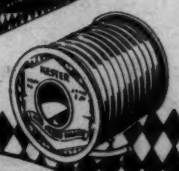

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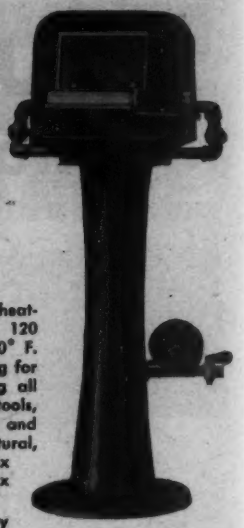

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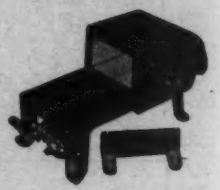

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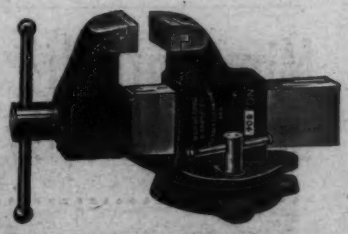

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T-3

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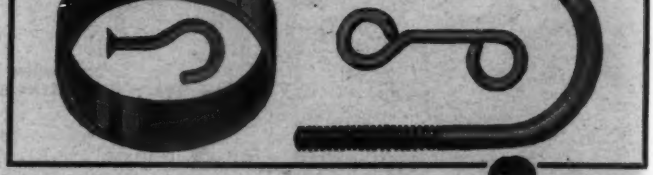

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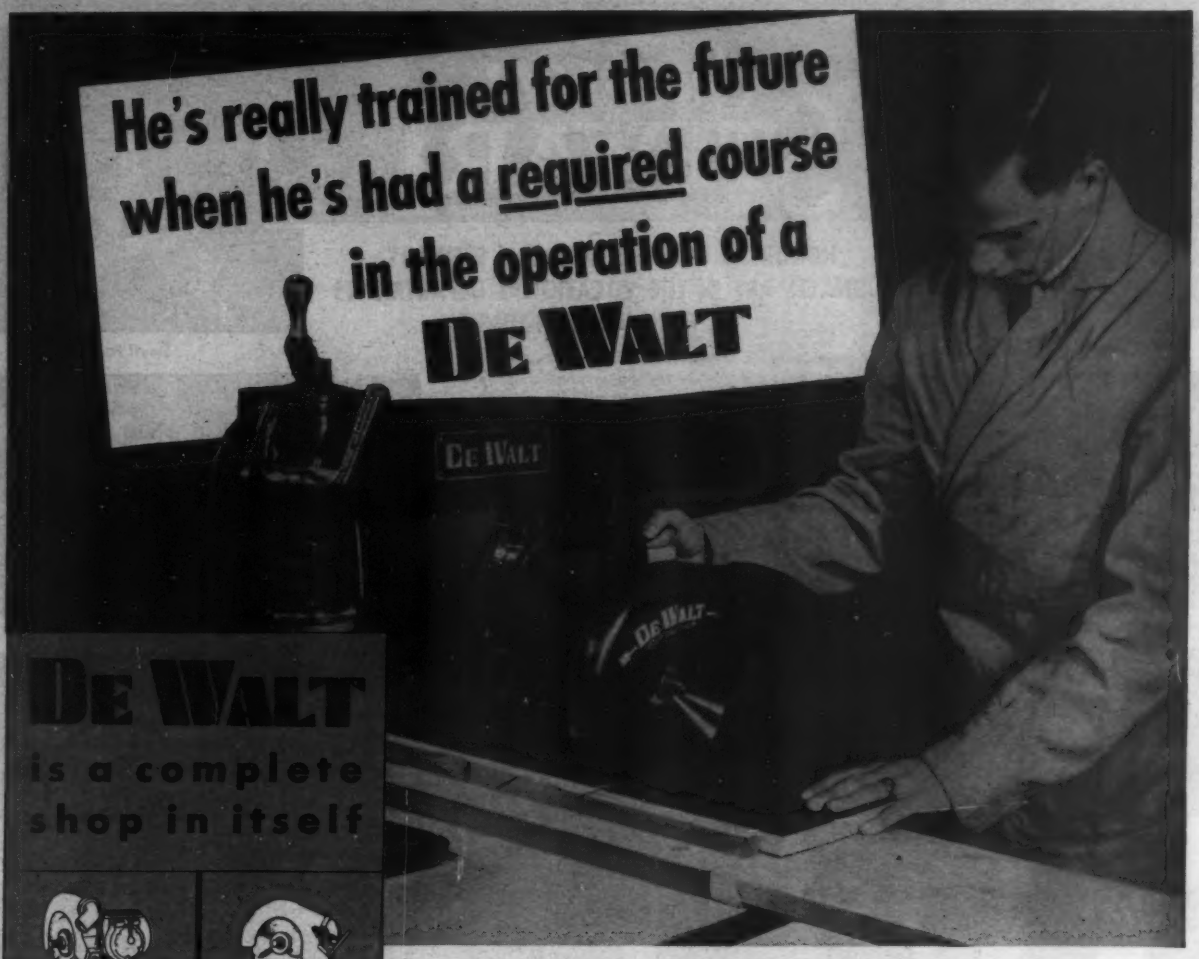
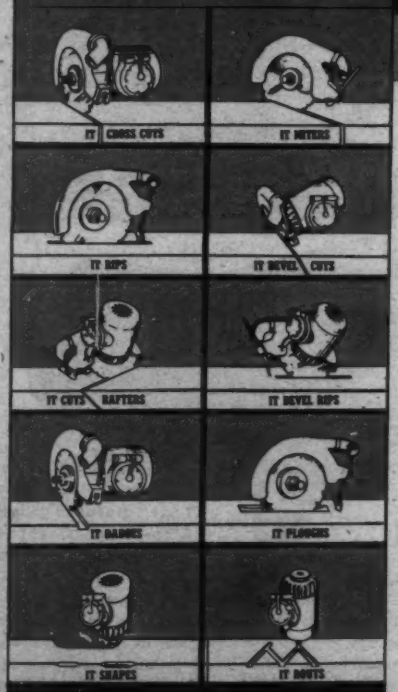


DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

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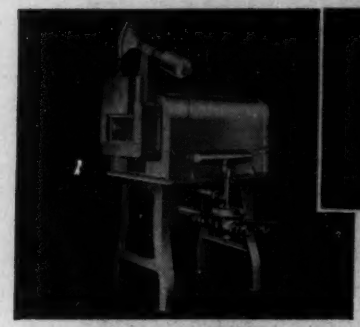

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Sunbeam STEWART

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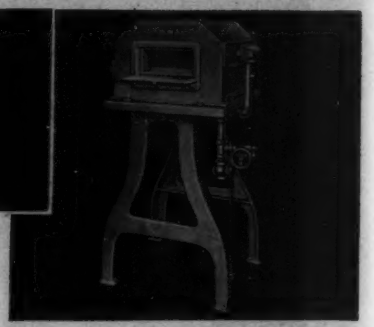

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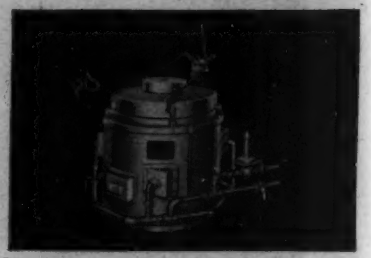
Round Pot Furnace



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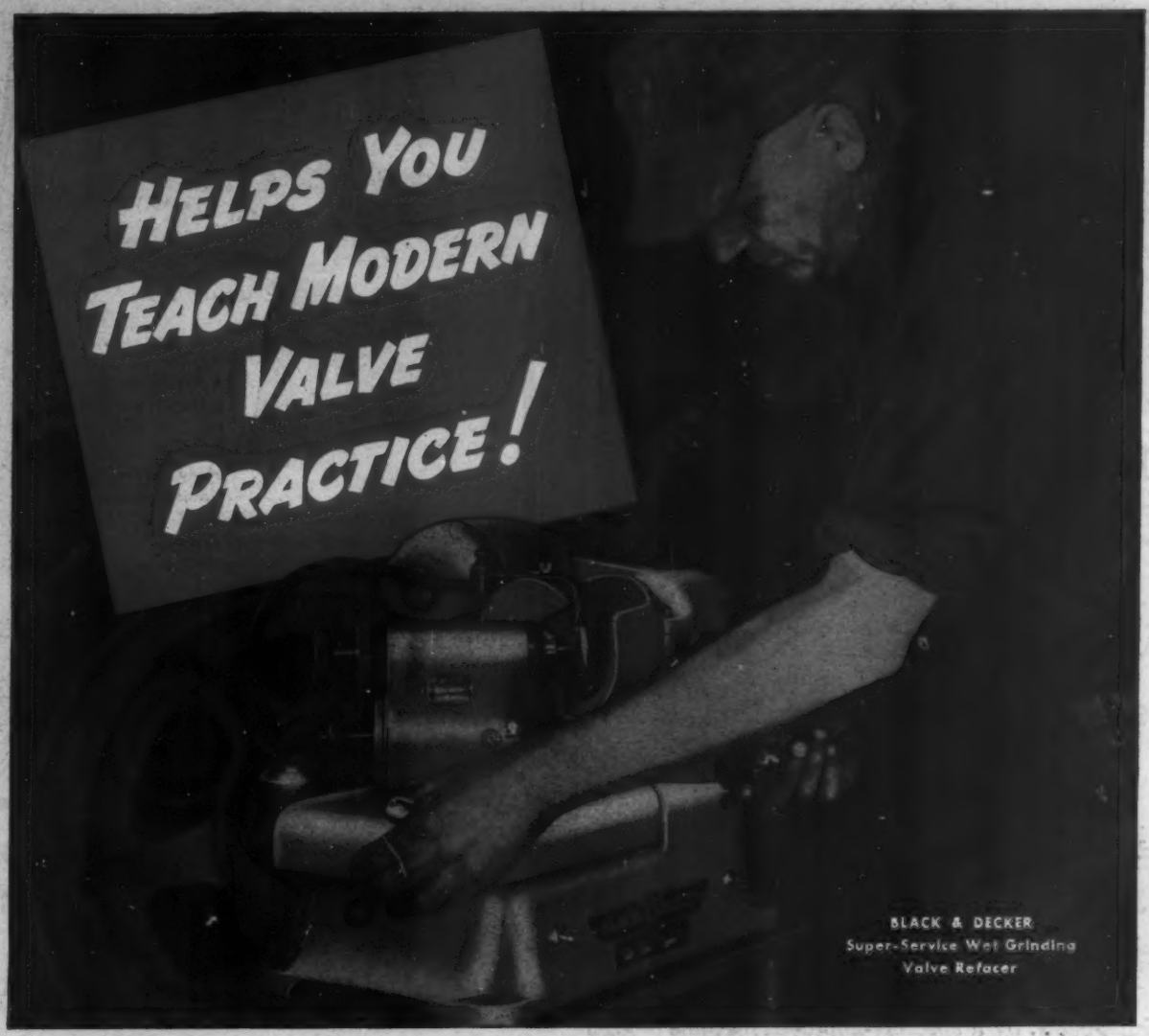

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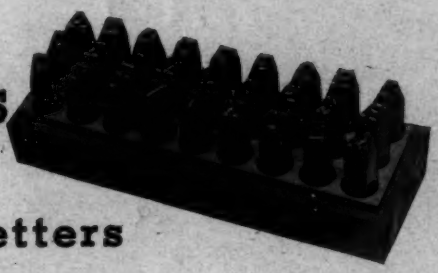

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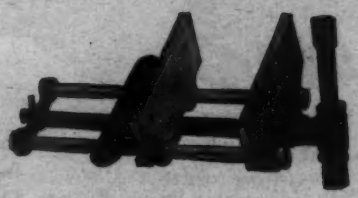

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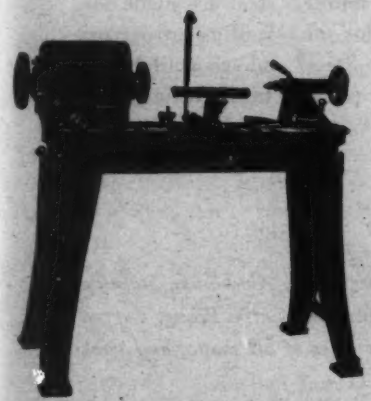

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VOL. 37, NO. 2 FEBRUARY, 1948

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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In This Issue

The end of the first semester of the school year 1947–48 is rapidly approaching. That means that the need for tests and testing will soon be at hand, and that is the reason for making this issue the annual testing number.

The tests published will, we hope, be helpful to those teaching retail selling, carpentry, beginning woodwork, orthographic projection and dimensioning, and electricity.

Other articles that are worthy of note are serial continuations such as Hankin's "Student Characteristics and Progress"; Bawden's "Some Leaders in Industrial Education"; Diamond's "Vocational Education and Society"; Jones' "Problems in Supervision and How to Meet Them"; and Groneman's "Teaching Materials for Industrial Education."

There also are some good problems and projects that may prove useful to some of our readers.

This Month's Cover

The illustration chosen for this month's cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows high school students doing architectural drawing in the industrial arts laboratory of the Los Alamos Schools, Santa Fe, N. Mex.

The photograph was submitted by Jerome Leavitt, supervisor of industrial arts.

Coming Conventions

Feb. 12–13. Oklahoma Education Association, at Tulsa, Okla. Secretary, C. M. Howell, 306 Key Building, Oklahoma City, Okla.

Feb. 15–18. Association for Supervision and Curriculum Development, at Cincinnati, Ohio.

Feb. 21–25. National Association of Secondary School Principals, at Atlantic City, N. J. Headquarters, Hotel Hadden Hall. Secretary, Paul E. Elicker, 1201 16th St., N.W., Washington, D. C.

Mar. 3–6. Georgia Education Association, at Atlanta, Ga. Headquarters, Municipal Auditorium. Secretary, J. Harold Saxon, 704 Walton Bldg., Atlanta, Ga.

Mar. 17–19. Mississippi Education Association, at Jackson, Miss. Headquarters, Hotel Heidelberg. Secretary, Floyd C. Barnes, Box 826, Jackson, Miss.

Mar. 18–20. New Jersey Vocational and Arts Association, at Asbury Park, N. J. Headquarters, Berkeley-Carteret Hotel. Secretary, John J. Berilla, 549 Corliss Ave., Phillipsburg, N. J.

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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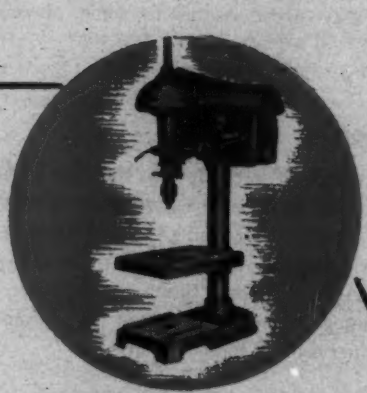

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-IAVE-
FEBRUARY . . 1948

Teacher Training in Industrial-Arts Education

PAUL N. WENGER
Chairman, Industrial Arts and
Vocational Education Department
Teachers College of Connecticut
New Britain, Conn.

The program of teacher training begins several months before the prospective student enters the freshman class at college, and ends long after he has embarked upon his professional career as a teacher. The college program normally covers a period of approximately four years.

What should take place during this four-year period which is spent in a teachers college, by one who majors in industrial-arts education? To explain this more effectively, it is well to consider each of the seven major phases which are essential for a well-balanced program in teacher training.

I. First, *it must provide an effective organization for recruitment.* Getting the right people enrolled in our curriculum is of primary importance. Because of the "G.I. Bill" and because of the fairly good salaries offered in the teaching profession, recruitment cannot be considered a major problem today. It so happens that more persons wish to enroll as industrial-arts majors than can easily be accommodated at the present time. However, in normal times, it requires the concentrated efforts of many persons to bring desirable young men into the profession of industrial-arts teaching.

II. Next, *it must provide a forceful policy in regard to screening.* Not all persons who wish to become industrial-arts teachers meet the basic qualifications necessary for success. Therefore, we must make an effort to screen out those who appear to be the least promising before they are admitted to the college. Nor can this screening process end as soon as the person enters college. The practice of eliminating the unfit must continue justly and effectively during their entire training period. In this way, those who are poorly fitted for teaching may be prevented from entering the profession.

It is easy to see that more students should enroll in a department than can possibly hope to graduate. Otherwise, how can we hope to select the best and eliminate the unfit? The faculty of a teacher training center must constantly bear in mind that they are trying to provide the best teachers for the youth of America, even though it may be disappointing to the students who are not permitted to continue their teacher training program.

III. Next, *we must provide intensive training in industrial-arts areas.* Inasmuch as the field of industrial arts is constantly expanding, it is becoming increasingly difficult to provide an adequate background for all students in all major phases of their field of specialization. There may come a day when an industrial-arts student will be able to specialize in two or three major areas of industrial arts, with a view to being placed in one or more of these areas. If this were the case, it would not be necessary to provide intensive training in the areas which are not included in his teaching schedule. We would then be free to concentrate in providing the best and the most intensive training in the areas which he would teach.

However, the difficulty with this practice lies in that of placement. Quite likely, industrial-arts teachers might accept assignments in areas in which they have had little training. Therefore, to safeguard the teacher-training institution against any such undesirable results, all industrial-arts students must be provided with intensive training in all phases of their major field. Upon graduation, they can then step into any of the major phases of industrial arts and do a satisfactory bit of teaching. It is quite evident that this places quite a responsibility upon the industrial-arts faculty of a teachers college.

The success or failure of the teacher training program depends largely upon the individual faculty members, the curriculum, the equipment and supplies, and the physical plant.

Just to consider the matter of equipment and supplies alone. The needs of an industrial-arts department are numerous and varied. Many of the items are expendable and, therefore, must be replaced. To provide all necessary items and to continue to keep them on hand requires considerable money. Herein lies a first-class headache for any teacher or administrator of industrial-arts subjects. When the people who hold the purse strings sharpen their red pencils and figure, they find that industrial-arts courses are much more costly than courses which require only a few supplies and almost no equipment. The budget of an English or a mathematics department, for instance, will be totally inadequate for the successful operation of a first class industrial-arts department.

IV. *We must provide a broad background of general education.* It is necessary for industrial-arts teachers to know more than their field of specialization. This is made possible by setting up a college curriculum which provides opportunities for the students to take courses covering a wide variety of interests. Very few educators question the wisdom of setting up a curriculum which will broaden the individual's culture. Therefore, the curriculum for prospective teachers of industrial arts, as for all other teachers, should contain a reasonable number of courses which lead toward a well-rounded educational background.

V. *We must provide opportunities for individual growth and development.* It is easy to see that the individual will need more than a mere wealth of skills and informations if he is to become a good teacher. We must be cognizant of the fact that the student normally develops into manhood during this four-year period. His

philosophies of life, of family, and of education are being formed. He must be prepared to function as a contributing member to the community. His interests and appreciations should be enriched. He must be able to evaluate his own needs and set up goals which he will strive to achieve. He must learn to plan, to make decisions, to initiate, and to carry out activities successfully. All this becomes a responsibility of the teachers college, if it wants to prepare its students to be more than moderately successful in the profession of teaching.

VI. *We must provide opportunities for student teaching.* Only by actually teaching under the guidance of a kind and sympathetic supervisor will the student gain the desired experiences in his chosen profession. Consequently, it is essential that an effective program be set up whereby each student will spend quite a bit of time teaching in the shop or classroom.

Students learn by doing. All the information and skills which the student has acquired must be translated into terms of actual teaching experiences. Otherwise, his information and skills remain in the theoretical stage and he will lack the ability to make the practical application which is so essential in the teaching profession. Thus it is one of the primary obligations of a teachers college to provide wholesome teaching experiences for all students, under competent supervision.

VII. *We must provide facilities for placement and follow-up.* After the student has passed all hurdles, and has proved his abilities as a teacher, we have the responsibility of placing him in a teaching position for which he is peculiarly adapted. Many factors must be considered in placing a student. Personal likes and dislikes, scarcity of positions, salaries, and geographic locations; all play an important part when placing a student to best advantage.

The responsibility of the teachers college does not end at this point. The beginning teacher will need help and guidance and we must be on hand to provide that which is desired and needed. In fact, our doors should always be open to our graduates when they need our help, when they request recommendations, and when they desire a change of positions.

Summary

The seven major responsibilities of an industrial-arts teacher training program are:

1. It must provide an effective organization for recruitment.
2. It must provide a forceful policy in regard to screening.
3. It must provide intensive training in industrial-arts areas.
4. It must provide a broad background of general education.
5. It must provide opportunities for individual growth and development.
6. It must provide opportunities for student teaching.
7. It must provide facilities for placement and follow-up.

Student Characteristics and Progress

EDWARD K. HANKIN
Lecturer, University of Pennsylvania
Philadelphia, Pa.

(*Continued from page 19 of the January, 1948, issue*)

Chart XI includes scattergrams showing the relationship between grades earned at Dobbins and grades earned in similar subjects at the previous school. By coding, these graphs also show (1) how the pupil with no previous shop experience performed in shop at Dobbins, and (2) how the pupil who left Dobbins before earning a grade there performed at the previous school.

The first scattergram, showing the relationship for shop grades is positive and fairly high. Disregarding the specially coded cases we find that eight cases vary more than one grade out of correlation and 55 per cent of the cases falling in perfect correlation. The largest single group out of perfect correlation are those who earned G in the previous school and F at Dobbins. This might be expected if we examine the distribution of shop grades earned in previous school and note the disproportionately high percentages (65 per cent) of G's earned.

In this first scattergram we also find that those cases with no previous shop grades are distributed exactly equally among the four grades at Dobbins, implying that the lack of previous shop experience is not an indice of success in this curriculum.

Likewise, we find an almost normal distribution of previous shop and classwork grades for those who did not stay long enough at Dobbins to earn grades. This data varies somewhat from that for those dropping out before the third term, as mentioned in the discussion of Chart V.

The second scattergram showing the relationship between classwork at Dobbins and at previous school shows correlation that is also positive and somewhat higher than that for the first scattergram. Here only six cases vary more than one grade from perfect correlation and 61 per cent of the cases fall in perfect correlation.

Since, of the four characteristics used in selection, the highest correlations were obtained for interview rating and for previous grades, *Chart XII* was drawn to explore the possibilities of a combination of these two as an indice of success. Thus, Index A was computed by adding the interview rating to a numeric value of the previous school grades (E–1, G–2, etc.). The minimum value of this index is 2, and the maximum (low) value, 9. The scattergram (*a*) shows the relationship between Index A and shop grades. The relationship is rather high and positive. A three-point band on each grade level obtains 80 per cent of the cases. This percentage is obtained by counting those cases with 2, 3, and 4 points earning E; 3, 4, and 5 points earning G; 5, 6, and 7 points earning F; and 6, 7, and 8 points earning P. Scattergram (*b*) shows the relationship between Index A and tenure in terms. This correlation is positive, but considerably lower than (*a*) with widely spread distribution. We find a median of 4 for those staying more than three terms, and a median of 6 for those staying less than three terms. Eighty-two per cent of those being graduated had an indice of less than 6, and 62 per cent had less than 5. Only 9.7 per cent of those staying less than three terms had an indice less than 5.

Chart XIII. This chart shows further exploration of the predictive values of a combined rating. The "Battery Index" used includes the ratings given in the four principal devices of the selective process. To the *interview rating* is added the "fifth" numbers for *I.Q.* and for *Mechanical Aptitude*, from Charts II and III, and a numeric value for the average of *previous school grades*, using the scale E = 1,

G = 2, F = 3, P = 4. The minimum value of this index is 4, and the maximum, 19.

Distribution (*a*) shows a range of 4 to 18, for 161 cases, with a median of 11. For comparison, the 48 graduates having sufficiently complete records for this purpose have been coded. The median index for this group is 9. Since some of the 161 cases in the distribution are active pupils and potential graduates, a truer comparison of the characteristics is obtained by eliminating the active pupils. The median index for the remaining 51 dropouts is 12. Only 30 per cent of the inactive pupils with indices over 12 remained to graduate. Only 27 per cent of the inactive pupils with indices less than 9 dropped out before graduation.

Scattergram (*b*) shows the relation between the battery index and shop grades. Those cases dropping before earning grades at Dobbins are recorded with those earning P and coded for identification. The correlation is positive but not so high as that in scattergram (*a*), Chart XII. The median index for those earning E is 9 while the median for those earning P is 13. Only 14 per cent of those earning P had an index less than 9 while 34 per cent of those earning G or E had an index less than 9. On the other hand, only 5 per cent of those earning G or E had an index over 13, while 43 per cent of those earning P had an index over 13.

Scattergram (*c*) shows the relation between the battery index and grades earned in classwork. The correlation is positive and higher than that obtained for shop grades. The median index for those earning E is 6 and for those earning P the median index is 13. Only 9 per cent of those earning P had an index less than 9 while 89 per cent of those earning E and 25 per cent of those earning G had an index less than 9. Only 6 per cent of those earning G or E had an index above 13 while 48 per cent of those earning P had an index above 13.

The correlation between the battery index and tenure in terms shown in scattergram (*d*) is positive but somewhat lower than those obtained in (*b*) and (*c*) on this chart. The median index for those with 6 terms' tenure is 9 and for those with less than 2 terms' tenure, the median index is 13½. Forty per cent of those with 6 terms' tenure had an index less than 9 while only 6 per cent of those with less than 2 terms' tenure had an index less than 9. On the other end of the scale, 4 per cent of those with 6 terms' tenure had an index above 13 while 50 per cent of those with less than 2 terms' tenure had an index above 13.

Chart XIV explores the relation between entrance age in years and shop marks. The correlation is negative with younger pupils earning somewhat better marks. Thirty-six per cent of those entering before age 15½ earned grades below G while 44 per cent of those entering after age 15 earned grades below G. This relation would not appear to be especially significant. However, this graph does serve to show the distribution of the group on the basis of entrance age. The median entrance age is 15 with only 12 per cent entering after age 16 and a range of 14 to 17½ years.

Chart XV further explores the significance of entrance age by showing the relation between entrance age and tenure. This correlation is also negative with pupils entering at lower age staying in the course longer. Only 3 per cent of those entering after age 16 remained more than 4 terms and 73 per cent of those entering after age 16 remained less than three terms. In comparison, 46 per cent of those entering before age 16 remained more than 4 terms and only 37 per cent of those entering before age 16 remained less than three terms. These percentages are higher than those in the general discussion of dropouts given earlier because of the exclusion, in the foregoing comparisons, of active pupils. Since Chart XV deals only with those pupils who have left the school, the calculations omit entirely the active pupils, many of whom, in groups 6, 7, 8, and 9 of Chart I, have remained more than two terms.

One possible explanation of the withdrawal of older pupils during the period of this study is the compulsory military service age of 18. On this chart is indicated by a heavy line the area including all dropouts after age 17½. Only those cases to the right and above this line can be considered as possible forced withdrawal by the Selective Service Act. Of those staying less than three terms, only 6½ per cent are over age 17½. Of those entering after age 16, 51 per cent of the total and 77 per cent of those dropping before third term were under selective service age of 18. This would seem to indicate that reasons for withdrawal other than Selective Service, prevailed.

Chart XVI, showing distribution of inactive pupils on the basis of age at time of separation, was compiled directly from Chart XV by adding the length of tenure to the entrance age. Median age at graduation is 18 while the median separation age of all others is 16½. Of those remaining after age 17, 64 per cent are graduates.

During the period under study, 15 pupils were admitted to this curriculum on a trial basis. For one reason or another there was a question as to whether these pupils were good candidates for this program, and this provisional admission was indicated on the school records. *Chart XVII* shows distributions of characteristics

Heat treating and tempering taught at the Hobart Trade School, Troy, Ohio

— Courtesy, Hobart Brothers Co., Troy, Ohio

and success of these pupils. Describing by the median we can say that the *on trial* pupil had an I.Q. of 104, 44 Stenquist score, interview rating 3, average previous shop grade *G*, average previous classwork grade *F*, Index A of 6, and Battery index 12.

Excluding those still active, half of those pupils admitted on trial withdrew before reaching the third term, while 30 per cent remained to the sixth term. The median shop and classwork grade earned by these pupils at Dobbins was *F* with 18 per cent of the work graded *P*.

On the basis of tenure this group compares well with those pupils admitted without reservation. On the basis of grades earned, however, this group stands low in comparison with the entire group, as shown in Chart IX.

While on the basis of the four elements of the admissions procedure this group is not significantly low, it appears that whatever the other factors were which caused them to be especially identified, the action was justified. Such things as previous poor attendance or co-operation records are frequently the basis of questioning the admission as well as a combination of low and high standings in the usual four considerations.

The success of these pupils would seem to justify continuing the practice of trial admission in those cases where there appears to be some hope for otherwise doubtful candidates. Always, of course, if limited capacity of the equipment does not mean displacing a more likely candidate.

Inferences and Conclusions

A. The first objective of this study is to discover whether the admissions predictive devices actually predict success in *this curriculum*. Charts VI, VII, VIII, and XI together with their analysis, constitute the gross answer to this question. From these charts and discussions the following points are capitulated.

1. It would appear that of the four devices under consideration, the interview rating and the previous school grades are by far the most significant.

2. Within the range of I.Q. for cases in this study (91 to 148), mental ability as measured is but a minor factor. This conclusion probably would not hold for cases below this range.

3. Conclusions regarding the significance of I.Q. would not necessarily hold true if there were a revision of the content of this curriculum.

4. Mechanical aptitude, as measured by the Stenquist Test I has practically no significant relation to success in this curriculum within the range of the cases in this study (22 to 80). This means one of two things. Either the Stenquist Test I does not measure the mechanical aptitude of these pupils, or factors other than this aptitude, such as interest and other aptitudes, are dominant.

5. For this curriculum, it would appear that the use of the Stenquist I should be discontinued. It would seem reasonable that other aptitude tests should be experimented with.

6. Since, for I.Q. and Stenquist scores, the correlation with measures of success are somewhat positive, these characteristics would reasonably enter into the selection of pupils when all other factors are equal. That is, in chosing between two cases between whom no other factor indicates a preference, the selection on the basis of I.Q. and Stenquist score could be justified.

7. While, as has previously been stated, the correlations between interview rating and measures of success are rather high, ratings of 4 should not, in themselves, indicate rejection. Ratings of 3 or 4 should require a closer examination of the previous school record. Ratings of 1 or 2 could be used as a direct indication of probable success without further considerations, providing available facilities permit that number of admissions.

8. Because of the close relationship between previous school grades and grades at Dobbins, the practice of examining these records in selecting pupils should be definitely continued.

9. Pupils with previous school shop grades averaging F should be checked closely for other evidence of likely success.

10. Absence of previous shop experience is of no significance to success.

11. Combined consideration of interview rating and previous school grades appears to be the most discriminating index of probable success (Index A). Combinations equal to or better than F–2, *G–3 or E–4*, are good indications of probable successful work.

12. The combined consideration of the four characteristics, as obtained in the "Battery Index," tends to broaden the discrimination obtained with Index A, and is not recommended.

13. The evidence indicates that for this curriculum entrance after age 16 shows little chance for success in terms of tenure. A change in employment conditions or the offering of a special curriculum for these older pupils would probably invalidate this conclusion.

14. The practice of admitting pupils on trial where there is room and some doubt of success could properly be continued.

B. The second objective of this study was to obtain complete data regarding certain characteristics which might be of value in future curriculum planning and course construction. Charts I, II, III, V, VI, VII, and IX especially point to this objective.

C. The third objective of this study is to experiment with devices which might be used in making a school-wide study. Sections describing Source of Data, Procedures — Accumulation of Data, and Procedure — Compiling of Data, respectively, on pages 402 and 403 of the December, 1947, issue, are pertinent to this objective, together with the several charts showing methods of displaying data.

With regard to a school-wide study it should be emphasized that there is no intention that the conclusions herein would apply to any but the curriculum upon which this study is based. It would seem desirable that a similar study of a more manipulative mechanical curriculum group be made so that comparisons of the results could be obtained. For instance, are the conclusions drawn with regard to I.Q. and Stenquist ratings peculiar to this curriculum or are they limitations inherent to the devices themselves?

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Thirty-five cities of 10,000 population or more completed 1946 without a traffic death. New Britain, Conn., with a population of 68,700, was the largest city to achieve this record. Hamtramck, Mich., was second and Watertown, N. Y., was third. — *National Safety Council.*

Some Leaders in Industrial Education

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(Continued from page 7 of the January, 1948, issue)

Ira Samuel Griffith

It would be difficult to select from among the prominent leaders in the field of industrial education and industrial arts as the subject of this fourth sketch a man characterized by a more striking contrast with the three leaders previously considered than Ira S. Griffith, not only in personality and educational background, but also in types of position held, and in the nature of the major contributions to the cause of education.

In the matter of educational background, first: two of these men, Calvin M. Woodward and Charles R. Richards, were graduates of the engineering college, and were entirely lacking in specific college preparation in what we now call "education" courses. I find nothing in the record to indicate that either of these men pursued their college or university preparation beyond the engineering degree. The third, Frederick G. Bonser, was a graduate of a university curriculum in "education," designed specifically for the preparation of teachers and school administrators. After completing the requirements for the baccalaureate degree, he continued his studies in the graduate school, specializing in psychology and school administration. Bonser was the only one of the four to hold the earned doctor's degree.

By contrast with these three, Griffith was the product of the old-time four-year "classical" curriculum, in a small denominational college. This curriculum was by far the most common offering of the small college during the closing decades of the nineteenth century, and even until well into the twentieth century. It was during the 1890's (earlier or later, according to the section of the country) that competition began to make itself felt in the form of the more modern "scientific" curriculum.

In further contrast, after completing the requirements for the A.B. degree, Griffith went on with college studies in the special field of preparation for teaching shopwork and mechanical drawing. After he began teaching industrial arts he continued part-time attendance upon college classes in shopwork and drafting, and, still later, he enrolled in the graduate school for more advanced studies in the philosophy and principles of education, psychology, and industrial education, although he never completed the requirements for the doctor's degree.

In one additional particular Griffith differed from two of the other three men in that he was a contemporary of mine in a sense that they were not. Dr. Woodward and Professor Richards really belonged to an earlier generation. While Dr. Bonser and I were contemporaries in the strictest chronological sense, because we were born only a few months apart, our most significant relation was that of teacher to student.

Griffith and I were graduated from college in the same month, June, 1896; completed similar curriculums, the old classical course; with the same degree, A.B.; from the same type of institution, the small denominational college, Eureka College and Denison University. Further, Griffith was a colleague of mine (as none of the other three was) in the special field of teaching shopwork and drafting to boys — he at Oak Park, Ill., 1903–12, and I at Normal, Ill., 1903–10.

A poll of the 30,000 or more industrial-arts teachers and supervisors in 1947–48 would show, I am confident, that only a small minority were active in this work at the time of Professor Griffith's death, in 1924, and would emphasize the truly remarkable speed and scope of the growth of the industrial-arts movement.

Early Life

Ira Samuel Griffith was born at Holton, Kans., July 24, 1874, and died at Madison, Wis., on April 29, 1924, following a short illness. While still a young lad, his family moved to Bloomington, Ill., where Griffith lived until he was ready to enter college.

Ira Samuel Griffith

His father was a contractor and builder, and the younger Griffith served a thorough apprenticeship under his father's tutelage. As a young man he gained considerable experience in carpentry, cabinetmaking, building construction, and contracting, including summer vacations after he entered college and during the early years of teaching. He was a graduate of Eureka College, Eureka, Ill., with the A.B. degree in 1896.

Following graduation he taught in the grades one year in Greenwood, Neb., where a sister lived, and two years in Bloomington, Ill. He was then employed as teacher of mathematics at Eureka College, from 1900 to 1903. After a year or two of this work, he became dissatisfied with the results he was accomplishing, and disturbed about his prospects for the future. Teaching mathematics seemed a bit *bookish* when viewed from his perspective of the more lively and objective experiences of a building contractor. In the educational journals of the day he learned some-

thing of the manual training movement then getting under way in the public schools of Illinois. He visited Bradley Polytechnic Institute (now Bradley University), in Peoria, 18 miles west of Eureka, where he made the acquaintance of Charles A. Bennett, at that time head of the Department of Manual Arts. During this interview he was inspired by a vision of a new type of schooling, the scope and possibilities of which appealed to him as a direct and personal challenge.

As the result of this visit, after due reflection, he decided to prepare himself to be a teacher of manual training. Here he found something that satisfied his sense of the practical in education. He was immediately convinced that it had a great future, and he believed he could throw himself into it with all-out enthusiasm and make a success of it. He made arrangements at Eureka College to be away from his teaching duties one day each week. At Bradley Institute, with the assistance of Mr. Bennett and several members of his staff, he received individual attention in the shops and drafting rooms, and put in an intensive day's work each week. In addition, he completed other assignments by working evenings at his home in Eureka. He enrolled as a full-time student in summer sessions, and thus made rapid progress.

Because of his practical experience with tools, machines, materials, and construction, supplemented by a liberal college education and several years of experience in teaching an academic subject, he possessed an unusual background upon which to base his preparation for teaching. It may be pointed out that this combination of personal qualifications in a manual training teacher was almost unheard of in the early 1900's. It is quite unusual even in the 1940's, for we still encounter college students who ask why they may not "duck" freshman rhetoric, sophomore speech, junior sociology, and senior economics, since they are "not needed" by the teacher of shopwork!

Teacher in the Oak Park Schools

In September, 1903, Griffith was offered a position as teacher of manual training in the seventh and eighth grades at Oak Park, Ill., a residential suburb adjoining the city limits of Chicago on the west side. Here he remained until the close of the school year in June, 1912. During this period I visited him in his school shop twice. He did all his teaching in one school, the Hawthorne Elementary School, which is located at the intersection of Washington Boulevard and South Ridgeland Avenue. To this school came all the boys of the seventh and eighth grades for one half day each week of instruction in manual training.

In Oak Park, Griffith was most fortunate in his superintendent of schools, the late William H. Hatch, who was an enthusiastic and intelligent supporter of manual training, home economics, art, and music in the public schools. It should be remembered that it was quite common in that day for superintendents and principals to dismiss these subjects as mere passing "fads and frills" and to boast of their devotion to the "solids" of education.

Mr. Hatch was one of the type of superintendents who read extensively, traveled widely, and was a student of public education. He visited schools in all sections of the country, with two objectives: (1) his board made it possible for him to offer good salaries, and he was continually on the lookout for superior teachers for the Oak Park schools; and (2) he wanted to see for himself the new buildings, the new equipment, the new programs, and the new teaching devices receiving publicity from time to time in educational journals and at teachers' conventions.

Mr. Hatch was an excellent public speaker, and in almost constant demand at meetings of teachers. I remember very well when he came to Bloomington, Ill., to be the principal speaker at the meeting of the Illinois Manual Arts Association, in February, 1906. I was secretary of the association, and had a favorable opportunity to make his acquaintance. In his address he gave evidence of careful study of the underlying philosophy of these newer subjects in the curriculum, and with reference to manual training in particular, a very intelligent conception of what industrial arts can and should do for boys in the public schools.

Through the courtesy of Miss Esther M. Sogge, secretary of the board of education, I am able to quote the following passage from Superintendent Hatch's Annual Report for the year ended June 30, 1903:

"That school education has to do with the hand as well as the mind is now so well recognized that no discussion of the subject is necessary. The question is entirely one of detail: what to do and how to do it. This work in schools has usually begun at the wrong end, the high school. All now recognize that the training of the hand should begin earlier than the fourteenth year of the child. Hence the attempt in our schools to supply the need. For several years construction work has been done in all the grades in connection with the drawing. . . .

"In September, 1902, a department of manual training for the boys of Grades 7 and 8 was organized. . . . The boys spend here one-half day school session each week. . . .

"I am sure that the work has developed accuracy, judgment, and patience as no other thing would have done in these boys. Their teachers tell me that their drawing and the general tone of their schoolwork has been raised by the manual training. . . . I am sure that to many of the boys it has been a great happiness; to the majority a pleasure and something to look forward to; to those few who have worked apparently without results, of some value, perhaps more than we can see; and to their instructor a happiness and lasting memory."

I call attention to Superintendent Hatch because I believe it is important to emphasize the contribution of the administration to the success of any constituent part of the program of any system of schools. Some of the factors of success in a program of industrial arts in any high school are almost wholly within the control of the shop teacher. With reference to certain other factors, however, the teacher can go only so far without the active assistance of his supervisor, or principal, if there be no supervisor. With reference to still other factors, the machinery does not function smoothly and efficiently without the sympathetic backing and support of the superintendent. Happy is the industrial-arts man who chooses his superintenndent with the rare good judgment shown by Griffith!

Personal Acquaintance

It was during this first decade of the twentieth century that I became acquainted with Mr. Griffith. Our first introduction was at the initial meeting of the Illinois Manual Arts Association, which was organized in February, 1904, at Bradley Institute, largely through the leadership of Professor Bennett and members of his faculty. This meeting occurred during my first year at Illinois State Normal University and Griffith's first year in the Oak Park schools. We found that we had many interests, experiences, and problems in common, and took a liking to one another from the start.

Griffith was one of the tallest men in our circle of industrial-arts leaders, standing six feet two inches in height. He looked his full height because he was rather spare in structure, weighing about 160 pounds. He was loosely built — I was about to say gangling, but I should not convey the suggestion of awkwardness or clumsiness. There was nothing of that in his make-up, either physical or intellectual.

He was most likable and approachable, with an engaging smile that was a real asset in making friends and in winning the approval of listeners in a discussion. His eyes had a merry twinkle, and one eyelid that seemed to be out of control part of the time, or else under excellent control. I know that sometimes I was

unable to decide whether he was actually winking, or whether it was an unconscious or involuntary reflex. Whatever it was, it accentuated the charm of his personality and the graciousness of his smile.

He possessed a well-developed sense of humor and a modest demeanor in expressing his opinions and convictions on matters under discussion.

He was remarkably successful as a teacher of boys in the Oak Park schools and developed a number of original and progressive features in his program of industrial arts. Superintendent Hatch made it a point to see that the numerous visitors to the Oak Park schools had opportunity to visit Griffith's shop, and thus it came about that he and his work were favorably known in widely separated places.

I visited his home in Oak Park twice. One occasion was in the spring of 1909, I think, although I cannot fix the date exactly. I was in Chicago to attend a convention of the Western Arts Association, and met Griffith in the lobby of one of the hotels. He invited me to spend the two nights of the convention in his home. He was alone at the time, for Mrs. Griffith and the two daughters were away on a visit. With justifiable pride he showed me over the house he had planned and built himself, with the assistance of day labor, in a summer vacation. When it came time to install the plumbing fixtures, he knew that this had to be done by workmen approved by the city inspector. He then found himself in a serious predicament when the inspector and plumber came out to look over the job and learned that the house had been erected by nonunion labor. I do not now recall how this problem was finally solved, but it was one of those trying experiences of the would-be home builder.

The Manual Arts Conference

Griffith and I met frequently, for we both attended rather regularly the annual conventions of the Illinois Manual Arts Association, and Western Arts Association, the old National Society for the Promotion of Industrial Education, the Illinois State Teachers Association, and the annual High School Conference at the University of Illinois. In addition, there were the somewhat more intimate and more intensive sessions of the Manual Arts Conference.

This Conference is itself the proper subject of a long story which I cannot go into just now. It must suffice to say that from 25 to 35 men, all heads of departments of industrial education in colleges and universities, met around a big table for two and a half days of concentrated discussion of professional problems related to the preparation of teachers of shopwork and drafting. These meetings afford opportunity for the development of lasting friendships as well as inspiration and professional growth.

The Conference was organized by Charles A. Bennett, at Bradley Institute, Peoria, Ill., in November, 1909. Griffith became a member at the fourth meeting, December, 1913, having been appointed in September of that year to the position of head of the department of industrial education at the University of Missouri, Columbia, Mo. I believe he attended every meeting from then until the fourteenth meeting, November, 1923, at the University of Wisconsin, which was the last one that occurred before his death in April, 1924. He was highly esteemed by the men who knew him in this intimate relationship of give and take, of exchange of ideas and experiences, and of intensive search for professional improvement.

The thirteenth meeting of the Manual Arts Conference was held at the University of Wisconsin, Madison, on January 11–13, 1923, during Griffith's term of service there as head of the Department of Industrial Education.

Evolution of a Textbook

Griffith made an outstanding contribution to the development of manual training in the public schools, not only through his effective methods of teaching and an enriched course of study, which quickly attracted nationwide attention, but especially through a series of textbooks which greatly influenced the movement. His academic background made him dissatisfied with a type of shopwork that consisted largely of tool exercises and processes, or even the mere making of projects.[1] From the beginning he insisted that manual training possesses significant educative "content" to be studied and learned, in addition to manipulative skills to be acquired, and experiences in planning and constructing to be enjoyed.

His background as a skilled mechanic made him appreciative of the satisfactions to be derived from making and doing things, which mean so much to the boy, and at the same time made it impossible for him to accept sloppy methods of workmanship and inferior standards of performance.

His conception of what a program of manual training should be called for the use of supplementary instruction material to guide and aid the pupil in learning.

He was an inspiring teacher and, as previously noted, very successful with boys. Later, he was equally successful with college students preparing to be teachers, and with apprentices, and with classes of mechanics and foremen representing various trades, seeking self-improvement.

Without minimizing these other attainments, those who knew Ira S. Griffith will agree, I think, that his greatest and most lasting contribution was made through his writings.

Early in his career as a teacher of woodworking be became dissatisfied with the results he was accomplishing because, as he put it, the boys were using tools and materials to produce shelves, stands, and bookcases, without really learning anything about tools, what they are made of, how they came to be invented and improved to their present status, and their significance to modern life and industry. The boys were learning little or nothing about where the finished lumber came from and how it is prepared for use by the worker. He visualized many other things that the boys could and should be *learning*, that would greatly enrich the experiences of school shopwork.

A little research revealed a wealth of information that could be drawn upon. He assembled quantities of this information, supplemented by what we moderns now call audio-visual instruction materials — some people talk and act as if teaching aids were discovered by the U. S. Army during World War II — and began giving a different type of instruction to his boys through short talks, exhibits, and demonstrations. He soon found that it is difficult to secure lasting impressions, and permanent additions to knowledge, by these methods alone. A passing glance at an illustration from a forest, a number mill, or a furniture factory, while interesting, leaves only a fleeting impression.

Again, Griffith was teaching in a city system of schools, and knew about the demand for larger and larger classes. The population of Oak Park was over 64,000 in 1930, and even in his day the schools were necessarily influenced by conditions and practices in near-by metropolitan Chicago.

In common with every other teacher who has tried to teach shopwork to more than a dozen boys at once, he discovered the impossibility of insuring that every boy grasps the desired details from one demonstration or class talk. Almost as soon as the pupils start work, following the demonstration, the instructor begins the

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[1]See Charles A. Bennett, *History of Manual and Industrial Education, 1870 to 1917* (Peoria, Ill.: The Manual Arts Press, 1937), p. 443.

endless task of repeating various details of the lesson to individuals here and there who did not get the complete picture the first time. With a class of 25 to 35 pupils, the shop period is not long enough to permit the instructor to repeat items of information, or instructions for the use of a tool or for the performance of some operation, for every pupil.

After repeating some formula of instruction for the fifth or tenth time, the instructor finds himself abbreviating, condensing, and eliminating, to the point at which he realizes that he is not actually teaching anyone anything.

Griffith was convinced that there was no way, at least for him, to avoid large classes, and that methods of teaching must be perfected that will enable the shop teacher to cope with classes of approximately the same size as those assigned to teachers of other subjects. In his study of the problem he fell back on his experience as a teacher of mathematics at Eureka College, and he tried to analyze the points of resemblance and difference in the two situations. He saw at once that one of the striking differences between the teacher of mathematics and the teacher of shopwork is that the former almost never tries to do his work without the aid of a suitable textbook.

In casting about for a textbook to be used in his teaching of woodwork to boys whom we would now describe as junior high school pupils, Griffith could find nothing that seemed to meet his need. He had been teaching long enough to formulate definite ideas as to what he wished to accomplish through his teaching, and he had some conception as to what part a textbook might contribute to the total achievement of the teacher.

There were in existence a few textbooks that included working drawings and instructions for making certain projects. Such a book, he reasoned, would not be very helpful to a teacher who did not care to have his pupils make the particular projects suggested by the author, nor would the book continue to be useful if the projects became obsolete. Griffith did not wish to adopt a textbook which would prescribe the content of his course of study by fixing on a series of projects, and thus would interfere with his freedom to introduce new ideas and improvements, and new projects from year to year.

He conferred with other teachers, and had several conferences with Mr. Bennett, who encouraged him to undertake the preparation of a textbook of his own. He solved the problem by taking the various hand tools used in the woodworking shop, one at a time, and preparing a set of instructions for each one, showing the proper methods and techniques for the use of that tool. Numerous illustrations showed how each tool is to be grasped in the hand, how it is to be applied in the operation for which it was designed, and other necessary detailed instructions.

Other sections of the book give condensed and interesting information about forestry, logging, sawmilling, and other steps in the process of preparing lumber for shop use. In a similar manner, finishing materials and processes were treated, in manner and language comprehensible by junior high pupils.

After considering other possible titles, Griffith called the textbook, *Essentials of Woodworking*. It differed from the very few books that had appeared up to that time, 1908, in that it could be used by any teacher in connection with any system or series of projects, with any course of study or with no course of study.

(To be continued)

Vocational Education and Society

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(Continued from page 15 of the January, 1948, issue)

Rating Sheet for Vocational Teachers of Trade and Industrial Subjects

Rating of..... School..... City.....

	1	2	3	4
1. Does the teacher have a definite vocational objective in mind?				
2. Does the teacher plan and proceed in an efficient way to accomplish the objective?				
3. Is he able to secure co-operation of other teachers and students in carrying out an effective program?				
4. Do his craftsmanship and personality secure the respect of the community craftsmen, students, and other teachers?				
5. Does he keep abreast of his trade or occupation?				
6. Does he make and maintain workable contacts with employers, labor leaders, and other community groups?				
7. Does he accept and use constructive supervision?				
8. Do his students secure employment and make good on the job?				
9. Does he follow up his students after they are employed?				
10. Does he secure and use the following teaching devices?				
a) Problems, cases, projects				
b) Questions				
c) Illustrations, drawings				
d) Demonstrations				
e) Production work in shop				
11. Does the work under his direction approach the best standards of the commercial shops of the community in the following?				
a) Processes of production				
b) Craftsmanship				
c) Safety devices and precautions				
d) Work habits				
e) Housekeeping				
f) Records and reports				
12. Has he met the professional requirements for such work?				

Department of Industrial Education
Teacher Rating Report

		1	2	3	4
I. Personality	15				
1. Personal appearance	4				
2. Use of voice	2				
3. Tact	4				
4. Courtesy	2				
5. Sympathy	3				
II. Teaching Skill	40				
1. Knowledge of subject	6				
2. Ability as a workman	5				
3. Clearness of objectives	4				
4. Definite planning of work	4				
5. Use of teaching devices	2				
6. Presentation	3				
7. Thought stimulation	4				
8. Integration	4				
9. Attitude toward individual differences	4				
10. Class spirit	4				
III. Co-operation	20				
1. With the principal	4				
2. With fellow teachers	4				
3. With the supervisor	4				
4. Loyalty to the school	4				
5. Loyalty to the community	4				
IV. Influence on Pupils	40				
1. Interest in school and community	5				
2. Sympathy with educational problems	5				
3. Optimism	2				
4. Use of correct English	5				
5. Ability to discipline	5				
6. Shop organization and upkeep	4				
7. Attention to hygiene and safety	4				
8. Interest in industrial exhibits	3				
9. Care of supplies	4				
10. Economy in use of materials	3				
V. Professional Spirit	40				
1. Continuous professional improvement					
a) Reading and study					
b) Correspondence courses					
c) Extension or summer courses					
d) Trade experience through employment					
2. Regularity in faculty meetings					
3. Membership in educational organizations					
4. Subscription to educational literature					
5. Ownership of a growing library of current professional literature					
6. Experiments with new methods					
7. Contributes effort and time in worthwhile social projects					
8. Length of schoolday outside of teaching hours spent in preparation for shopwork					
9. Punctuality — records, reports, etc.					
10. Self-control					
VI. Health	15				
1. General health — physical endurance					
2. Deformities					
VII. Character	30				
1. Moral stability					

TEACHER RATING SHEET
Rating of Smith-Hughes Teachers for Class A

Name of teacher..... School..... City.....

	1	2	3	4	5
I. Personality					
1. Is he neat in his appearance?					
2. Is he courteous?					
3. Is he tactful?					
4. Does he use good English?					
II. Teaching					
1. Does he have a well-formulated plan in his work?					
2. Are his objectives clear in his mind?					
3. Do his pupils show evidence of interest and industry?					
4. Does he show initiative in offering suggestions for the improvement of his work?					
5. To what extent does the work done under his supervision approach the best standards of commercial practice?					
6. Do you rate him as a master teacher in his major subject?					
III. Organization					
1. Is he a good housekeeper?					
2. Does he insist upon safety devices being used?					
3. Are tools handled efficiently?					
4. Are materials handled efficiently?					
5. Does he keep adequate records?					
6. Are tools and equipment in good working order?					
IV. Attitude in School					
1. Does he see his work as part of the whole school program?					
2. Does he co-operate with his associates and with the administration?					
3. Does he have the right attitude toward his fellow teachers?					
4. Is he respected by the other members of the faculty?					
5. Is he dignified, serious, and friendly with his pupils?					

Rating Scale

Skill in Teaching	*Superior*	*Average*	*Poor*
1. Does he show evidence of knowing the trade he is teaching?	.....	.....	.....
2. Are his aims in teaching clearly defined?	.....	.....	.....
3. Does his teaching show careful planning?	.....	.....	.....
4. Does there appear to be a wholesome attitude (morale) among students?	.....	.....	.....
5. Are instructions definite and easily understood?	.....	.....	.....
6. Are students working with interest and enthusiasm?	.....	.....	.....
7. Is he active, alert, and anxious to serve (humanly sympathetic)?	.....	.....	.....
8. Is his personality such as to draw			

Skill in Teaching	*Superior*	*Average*	*Poor*
students to him?	.....	.....	.....
9. Does he show skill in the use of demonstration charts and teaching devices?	.....	.....	.....
10. Do students show rapid progress under his teaching?	.....	.....	.....
Teamwork Qualities			
1. Does he co-operate cheerfully with other teachers, principal, and supervisors?	.....	.....	.....
2. Does he show a deep loyalty to his craft and high regard for his fellows?	.....	.....	.....
3. Are his reports and records complete and on time?	.....	.....	.....
4. Is a wholesome teacher-student relationship apparent?	.....	.....	.....
5. Does he co-operate in keeping machines and tools in good order?	.....	.....	.....
Personal Qualities			
1. Does he attract people to him in a natural way?	.....	.....	.....
2. Does he show neatness in dress and general appearance?	.....	.....	.....
3. Does he show good judgment and tact in dealing with people?	.....	.....	.....
4. Is he keen and alert in conversation, yet modest in self-assertiveness?	.....	.....	.....
5. Is he in good health and are his habits satisfactory?	.....	.....	.....

Rating Sheet for Vocational Teachers of Trade and Industrial Subjects

Rating of..... School..... City.....
Teacher

(*This is a strictly confidential report.*)

Directions for Use: Check in the column which approximates the degree of proficiency. If entirely lacking check (0) and if present to a high degree check (20), three intermediate levels being provided. A total score of 600 to 820 (max.) is very satisfactory, while a score below 300 is unsatisfactory.

	Poor 0	*Fair* 5	*Average* 10	*Good* 15	*Superior* 20
1. Does he have a definite vocational objective in mind?					
2. Does he have and follow a well-organized course of study?					
3. Does he have a definite plan which he follows in his work?					
4. Does he see his work as a part of the whole school program?					
5. Does he co-operate with his associates?					
6. Does he have the right attitude toward his fellow teachers?					
7. Is he respected by the other members of the faculty?					
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9. Does he attend and profit by professional meetings?					
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12. Does he take professional training courses?					
13. Does he keep himself informed on, and incorporate in his courses, the changes in industrial practice?					
14. Does he accept suggestions in the right spirit?					
15. Does he accept extra assignments willingly?					
16. Does he take an active part in community activities?					
17. Does he have his room opened in time to start classes promptly?					
18. Does he remain after class to accommodate student needs, or does he close shop with the clock?					
19. Do his pupils respect him?					
20. Does he evidence sincerity and reveal a spirit of service as his motivating purpose?					
21. Do his pupils show evidence of interest and industry?					
22. Does his shop show evidence of good housekeeping?					
23. Does he keep accurate and adequate records?					
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25. Are his reports submitted on time?					
26. Has he developed a good shop organization?					
27. Does he have an efficient system for handling tools?					
28. Does he have an efficient system for handling materials?					
29. Does he concern himself with the installation of safety devices?					
30. Are satisfactory safety measures in operation in his room?					
31. Does he prepare suitable lesson sheets to supplement textbook materials, and to make the students' work more purposeful?					
32. Does he allow his students to participate in planning class procedures so as to develop desirable democratic techniques, or does he dictatorily set all rules and procedures?					
33. Do his pupils evidence the ability to co-operate voluntarily in the solution of classroom problems, or does he assume the role of dictator?					
34. Are his students developing the ability to plan and think for themselves, or are all projects worked out from fully detailed job sheets which deny them the right to think?					

	Poor 0	Fair 5	Average 10	Good 15	Superior 20
35. Are his students developing self-appraisal by devising appraisal techniques and using rating devices, or does he arbitrarily grade each project?					
36. Does he provide for generalizations and interpretations at the conclusion of each new experience, or are valuable learning opportunities ignored?					
37. Does he maintain contacts with industry for purposes of placement and mutual co-operation?					
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Following for adult classes only:					
39. Does he know the specific occupation or position of each student with its future possibilities?					
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41. Does he attempt to meet the individual needs of his students?					
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Totals					
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Rated by..... Title..... Date.....

Problems in Supervision and How to Meet Them

WALTER B. JONES
Consultant in Teacher Education
Rio de Janeiro, Brazil
On leave from the University of Pennsylvania

(Continued from page 12 of the January, 1948, issue)

Teachers' Suggestions to Supervisors

In addition to the solutions of difficulties received from members of the National Association of Industrial Teacher Trainers, the writer contacted a number of local directors of vocational education of his acquaintance asking them, with the help of one or two shop teachers from their staffs, to comment on supervisory relationships. These comments are reported, therefore, from three points of view — what the teachers wish from their supervisors, what the supervisors' difficulties are and how they are to be solved, and what the directors' problems are with supervisors and teachers and their methods of meeting them. Some of the reactions of these vocational teachers are reported in this part of the article. The problems relating to supervision reported by supervisors and those reported by administrators are presented in the following.

Suggests That Visiting Schools Improve Teachers

How do you plan opportunities for teachers to observe selected teaching procedures? Are teachers encouraged to visit other classes?

"At certain times during the school year, teachers made visits to vocational schools in near-by cities. Reports of school visits are made at group meetings. New ideas are easily and economically exchanged. Visits have not been made by our teachers in the past several years.

"Teachers should be encouraged to attend conventions. Report of such attendance should be made to the group. Much benefit may be derived for the good of all. Supervisors should put forth every effort for teacher attendance at conventions and visits to other vocational schools of other cities."

Criticizes Supervisor Who Takes the Class From the Instructor

Can you justify the humiliation of an instructor caused by the supervisor taking over a demonstration partially underway? If so, under what circumstances?

"Upon his entry into the shop the supervisor should in no way take part in the teaching of the class, unless the instructor in charge requests him to do so.

"Case: The instructor was making a demonstration to a group of students when the supervisor entered the shop. He observed the demonstration for a short time, then abruptly broke in and took over the demonstration. This act humiliated the instructor and certainly caused the students to lose confidence in his teaching."

"If I found that the instructor was not doing a good job of teaching, I would proceed as follows:

"(*a*) Leave the shop until the demonstration was completed; (*b*) re-enter the shop and ask the instructor if I could, in any way, be of assistance to him. I would help him with any problem that he might have; (*c*) if he had not mentioned any problems about teaching, I would now very tactfully give him pointers on improving his demonstration."

Giving to Teachers a Summary of Inspection Visit

Should copies of official reports or oral summaries of inspection be given to teachers? If not, how can they profit by inspection?

"We are quite fortunate in our relations with our supervisor. However, in making inspection visits I believe the teacher should receive a carbon copy of the official reports regarding his work. Under the present local system the instructor does not know whether his work is good, bad, or indifferent."

"A short time ago in making an official safety inspection the supervisor called attention to the fact that one stud holding a disk on a 12-in. sander was loose (they were worn and new ones were being made) and it was a hazard. The statement was accepted and the condition corrected within a day or two. However, about a month later the building principal came down with a letter from the supervisor referring to that hazard and commenting on a jointer guard being broken which wasn't true. After a 22-year accident-free record in my shop to have the principal receive a letter from the supervisor with those statements made me just plain mad."

"I have had several awkward situations develop as a result of giving a teacher a written report of his work. The supervisor may be placed on the defensive with 'demands of proof.' I think it is a well-known fact that some school supervisors seldom rate teachers as unsatisfactory because of the difficulty of 'proving' an unsatisfactory rating. Recently I rated a teacher unsatisfactory in some categories at the request of the central administration. The rating sheet was shown to the candidate by a clerk in the board office whose action was defended by those in authority, with the result that political pressure was brought to bear on me from several sources in this community to change the rating. This I refused to do. Two weeks later I received a request from the board office for a rating on another candidate. I threw it into the wastepaper basket."

"Where official reports are made, a copy is given to the teacher."

"They should not know everything."

"Do not believe in official reports of inspection; prefer to take care of problems as they arise and at the source."

Wants Supervisor to Visit Regularly

Many teachers believe that they are slighted by supervisors through infrequent visits. They report that little time is taken for confidential discussion of teachers' problems. Do you want to comment on this?

"This is probably true. It is difficult to discuss these problems during class hours and about the only time it can be done is during the teacher's free period or after school, and unless the matter is important the supervisor hesitates to use the teacher's time. However, I do not think this is good practice."

"The supervisor should make frequent visits to the shop, even though the visit may only take a few minutes; and here the instructor's individual problems should be discussed. These visits would not only help the instructor with his problems, but would certainly make him feel that his shop plays an important part in the whole system.

"Case: I sent a floor jack out for repairs. This jack is a necessary piece of equipment in this shop. It has now been three months since the jack has been sent out and to date I have no idea when it might be returned. At present I am sharing a jack with another shop, which makes it rather inconvenient for both shops. This matter should have been brought to the attention of the supervisor before this, but due to the fact that he comes to the shop so seldom, I have not had the opportunity of mentioning the matter to him as often as I wished."

"If I were the supervisor I would:

"(*a*) Visit each shop at least twice each month; (*b*) make a record of unsolved problems discussed at each meeting; (*c*) follow up matters that were discussed at the last meeting; (*d*) inquire about the different phases of shop such as equipment, materials, student progress; (*e*) attempt to give the instructor definite answers to all questions (avoid leaving the instructor in doubt)."

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"Case: While looking over the shop, the supervisor came upon a student, who was having some difficulty with a job. He proceeded to demonstrate to the student a method which was different from the instructor's method of doing the job. The result was, the student became so confused that he had even greater difficulty in mastering the job.

"If the student had been able to do the job after the supervisor's demonstration, he would probably have lost faith in his own instructor. If I found a student who was having some difficulty in doing a job, I would proceed as follows:

"If the student was endangering anyone's safety, I would ask him to shut down his machine until the instructor came to help him.

"If the student was not endangering anyone's safety, and the instructor did not come to help him within a reasonable period of time, I would have mentioned the case to him. It could have been possible that the student was assigned to work out the problem for himself."

Suggests Advisory Committee Should Function

In working with advisory committees what techniques of organizing, selecting committee personnel, and conducting meetings do you recommend?

"An advisory committee composed of men from industry should co-operate with the vocational setup. We have such a committee but the committee should function. What good can be derived from something that is dormant? In conjunction with this committee, I would have a placement and follow-up division. Scientific data could be compiled and used to improve the vocational curriculums. At present we are lacking such an advantageous setup." (See recommended plan in Part I.)

Requests Better Contact Between Industries and Schools

What methods do you use to encourage teachers to visit places of employment of trainees to get a firsthand picture of training needs? Is this the supervisor's function?

"One problem that I think should be handled by the supervisors is the lack of contact between the industries and the schools. The schools do not know the direct requirements of the shipyards and industries. Our general training seems to be sufficient to obtain jobs for our trainees, but if we knew the industries' specific needs, we could do a better training job.

"We teach safety in our courses, but not always according to the industries' safety

standard. A list of these safety requirements could be worked out for each training period. That would familiarize the trainee with industries' safety requirements and he would be ready to carry them out from his first day of employment."

Asks That Equipment Be Kept in Working Order

How do you manage so that equipment is kept in working order at least up to reasonable industrial standards?

"I have talked with our vocational teachers about our supervision and I find their main criticism concerns the difficulty we have in keeping up to date in equipment. However, our supervisor is constantly alert and makes many valuable suggestions for improvements."

(To be continued)

Teaching Materials for Industrial Education

CHRIS. H. GRONEMAN
Acting Head, Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

(Continued from page 22 of the January, 1948, issue)

BULLETINS AND BOOKLETS

Plastics

Catalin Corporation of America, 1 Park Ave., New York 16, N. Y.
Catalin: Properties and Specifications
Loalin: Polystyrene Molding Compounds
The Fabrication of Catalin — Methods and Equipment
Catalin-Cast Resins, Liquid Resins, Molding Compounds

Celanese Corporation of America, 180 Madison Ave., New York 16, N. Y.
Celanese Plastics
The Story of Celanese Plastics
Unit Prepackaging
Lumarith Transparent Film
Vimlite
Celanese Plastics — monthly magazine

Chicago Molded Products Corp., 1020 North Kolmar Ave., Chicago 51, Ill.
The Story of Plastic Molding (single copies free to teachers only)

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Handbook for Drillers

Continental-Diamond Fibre Co., Newark, Dela.
Electrical Insulating Materials
Dilecto — a Laminated Phenolic Plastic
Diamond Vulcanized Fibre
Bulletin GF-46 — C-D & Non-Metallic Basic Materials

Craftsman Supply House, Scottsville, N. Y.
Craftsman Acrylic Plastics (Plexiglas)
Craftsman Cameos
Craftsman Phenolic Plastics (Catalin)
Catalog

The Dow Chemical Co., Midland, Mich.
Fulfilling the Promise of Plastics
Ethocel (ethylcellulose)
Styron (polystyrene)
Plastic Primer
(No samples available at this time of plastic molding granules and powders)

E. I. Du Pont De Nemours & Co., 626 Schuyler Ave., Arlington, N. J.
Plastics Bulletins No. 31, 33, 35, 36, and 37

Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.
Durez from Raw Materials
Durez Plastics Primer
Machining Data on Phenolic Plastics

Fellowcrafters, Inc., 130 Clarendon St., Boston 16, Mass.
General Catalog

Formica Insulation Co., Cincinnati, Ohio
What Industrial Formica Is
Colorful Plastics Surfaces of Formica
Plastic Push and Kick Plates of Formica

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio
Geon Polyvinyl Materials (illustrated manual)

Heller Brothers Co., 865 Mt. Prospect Ave., Newark 4, N. J.
Nucut Files — 100 Years of Experience (1936 publication, 100 Year Anniversary Catalog, extra size)
F-45 File Catalog
T-44 Tool Catalog
Rotary File Catalog

Hydraulic Press Mfg. Co., Mount Gilead, Ohio
H.P.M. Presses for Compression and Transfer Molding of Plastics, No. 4702
H.P.M. Turbojector for Injection Molding of Rubber, No. 4601
H.P.M. Plastics — The Pressure Processing of Synthetic Resins, No. 4404
All-Hydraulic Plastics Injection Molding Machines, Model 350-H-16, No. 4405
All-Hydraulic Plastics Injection Molding Machines, Model 250-H-9, No. 4503

The Rayon Processing Company of R. I. Inc., 86 Tremont St., Central Falls, R. I.
Literature on Flock, Its Application, and Usage

Resistoflex Corp., Belleville 9, N. J.
The Compar — New Family of Rubber-Like Materials
Resistoflex Protective Clothing (general catalog)
Resistoflex Industrial Catalog
Resistoflex Automotive Catalog

Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.
Plexiglas Design Manual
Plexiglas — Mechanical Properties
Plexiglas on Guard (machine safety)
Working With Plexiglas — $1.50

The Society of Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y.
Plastics, The Story of an Industry (single copies free)

Synthane Corp., Oaks, Montgomery Co., Pa.
Technical Plastics Sample Book
Technical Plastics for Industry
Synthane Laminated Plastic Tubing for Radio and Electrical
Practical Methods of Machining Bakelite-Laminated
Corrosion-Resisting Synthane
Synthane Technical Plastics

Taylor Fibre Co., Norristown, Pa.
Taylor Laminated Plastics Catalog

Transportation

Air-Age Education Research, 100 East 42nd St., New York 17, N. Y.
Into the Air Age — 25 cents
Opportunities for Youth in Air Transportation — 25 cents
Aviation Maintenance — 10 cents
Here, There, Anywhere — The Education of an Airline — 10 cents
How to Build a Wind Tunnel — 50 cents
Air Age Education News — bimonthly

Association of American Railroads, Transportation Bldg., Washington 6, D. C.
Behind the Scenes
The Day of Two Noons
Technological Developments and Railway Research
The Human Side of Railroading
Development of Railroad Transportation in the United States
Railroads at Work
The Great American Railroad
Railway Information Series:
Railway Literature
Quiz on Railroads and Railroading

Skill in Teaching	*Superior*	*Average*	*Poor*
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9. Does he show skill in the use of demonstration charts and teaching devices?	.....	.....	.....
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"An advisory committee composed of men from industry should co-operate with the vocational setup. We have such a committee but the committee should function. What good can be derived from something that is dormant? In conjunction with this committee, I would have a placement and follow-up division. Scientific data could be compiled and used to improve the vocational curriculums. At present we are lacking such an advantageous setup." (See recommended plan in Part I.)

Requests Better Contact Between Industries and Schools

What methods do you use to encourage teachers to visit places of employment of trainees to get a firsthand picture of training needs? Is this the supervisor's function?

"One problem that I think should be handled by the supervisors is the lack of contact between the industries and the schools. The schools do not know the direct requirements of the shipyards and industries. Our general training seems to be sufficient to obtain jobs for our trainees, but if we knew the industries' specific needs, we could do a better training job.

"We teach safety in our courses, but not always according to the industries' safety

standard. A list of these safety requirements could be worked out for each training period. That would familiarize the trainee with industries' safety requirements and he would be ready to carry them out from his first day of employment."

Asks That Equipment Be Kept in Working Order

How do you manage so that equipment is kept in working order at least up to reasonable industrial standards?

"I have talked with our vocational teachers about our supervision and I find their main criticism concerns the difficulty we have in keeping up to date in equipment. However, our supervisor is constantly alert and makes many valuable suggestions for improvements."

(To be continued)

Teaching Materials for Industrial Education

CHRIS. H. GRONEMAN
Acting Head, Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

(Continued from page 22 of the January, 1948, issue)

BULLETINS AND BOOKLETS

Plastics

Catalin Corporation of America, 1 Park Ave., New York 16, N. Y.
- *Catalin: Properties and Specifications*
- *Loalin: Polystyrene Molding Compounds*
- *The Fabrication of Catalin — Methods and Equipment*
- *Catalin-Cast Resins, Liquid Resins, Molding Compounds*

Celanese Corporation of America, 180 Madison Ave., New York 16, N. Y.
- *Celanese Plastics*
- *The Story of Celanese Plastics*
- *Unit Prepackaging*
- *Lumarith Transparent Film*
- *Vimlite*
- *Celanese Plastics* — monthly magazine

Chicago Molded Products Corp., 1020 North Kolmar Ave., Chicago 51, Ill.
- *The Story of Plastic Molding* (single copies free to teachers only)

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
- *Handbook for Drillers*

Continental-Diamond Fibre Co., Newark, Dela.
- *Electrical Insulating Materials*
- *Dilecto — a Laminated Phenolic Plastic*
- *Diamond Vulcanized Fibre*
- *Bulletin GF-46 — C-D 6 Non-Metallic Basic Materials*

Craftsman Supply House, Scottsville, N. Y.
- *Craftsman Acrylic Plastics* (Plexiglas)
- *Craftsman Cameos*
- *Craftsman Phenolic Plastics* (Catalin)
- *Catalog*

The Dow Chemical Co., Midland, Mich.
- *Fulfilling the Promise of Plastics*
- *Ethocel* (ethylcellulose)
- *Styron* (polystyrene)
- *Plastic Primer*
- (No samples available at this time of plastic molding granules and powders)

E. I. Du Pont De Nemours & Co., 626 Schuyler Ave., Arlington, N. J.
- *Plastics Bulletins No. 31, 33, 35, 36, and 37*

Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.
- *Durez from Raw Materials*
- *Durez Plastics Primer*
- *Machining Data on Phenolic Plastics*

Fellowcrafters, Inc., 130 Clarendon St., Boston 16, Mass.
- *General Catalog*

Formica Insulation Co., Cincinnati, Ohio
- *What Industrial Formica Is*
- *Colorful Plastics Surfaces of Formica*
- *Plastic Push and Kick Plates of Formica*

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio
- *Geon Polyvinyl Materials* (illustrated manual)

Heller Brothers Co., 865 Mt. Prospect Ave., Newark 4, N. J.
- *Nucut Files — 100 Years of Experience* (1936 publication, 100 Year Anniversary Catalog, extra size)
- *F-45 File Catalog*
- *T-44 Tool Catalog*
- *Rotary File Catalog*

Hydraulic Press Mfg. Co., Mount Gilead, Ohio
- *H.P.M. Presses for Compression and Transfer Molding of Plastics, No. 4702*
- *H.P.M. Turbojector for Injection Molding of Rubber, No. 4601*
- *H.P.M. Plastics — The Pressure Processing of Synthetic Resins, No. 4404*
- *All-Hydraulic Plastics Injection Molding Machines, Model 350-H-16, No. 4405*
- *All-Hydraulic Plastics Injection Molding Machines, Model 250-H-9, No. 4503*

The Rayon Processing Company of R. I. Inc., 86 Tremont St., Central Falls, R. I.
- *Literature on Flock, Its Application, and Usage*

Resistoflex Corp., Belleville 9, N. J.
- *The Compars — New Family of Rubber-Like Materials*
- *Resistoflex Protective Clothing* (general catalog)
- *Resistoflex Industrial Catalog*
- *Resistoflex Automotive Catalog*

Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.
- *Plexiglas Design Manual*
- *Plexiglas — Mechanical Properties*
- *Plexiglas on Guard* (machine safety)
- *Working With Plexiglas* — $1.50

The Society of Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y.
- *Plastics, The Story of an Industry* (single copies free)

Synthane Corp., Oaks, Montgomery Co., Pa.
- *Technical Plastics Sample Book*
- *Technical Plastics for Industry*
- *Synthane Laminated Plastic Tubing for Radio and Electrical*
- *Practical Methods of Machining Bakelite-Laminated*
- *Corrosion-Resisting Synthane*
- *Synthane Technical Plastics*

Taylor Fibre Co., Norristown, Pa.
- *Taylor Laminated Plastics Catalog*

Transportation

Air-Age Education Research, 100 East 42nd St., New York 17, N. Y.
- *Into the Air Age* — 25 cents
- *Opportunities for Youth in Air Transportation* — 25 cents
- *Aviation Maintenance* — 10 cents
- *Here, There, Anywhere — The Education of an Airline* — 10 cents
- *How to Build a Wind Tunnel* — 50 cents
- *Air Age Education News* — bimonthly

Association of American Railroads, Transportation Bldg., Washington 6, D. C.
- *Behind the Scenes*
- *The Day of Two Noons*
- *Technological Developments and Railway Research*
- *The Human Side of Railroading*
- *Development of Railroad Transportation in the United States*
- *Railroads at Work*
- *The Great American Railroad*
- Railway Information Series:
  - *Railway Literature*
  - *Quiz on Railroads and Railroading*

List of Named Passenger Trains of the United States, Canada, and Mexico
List of Principal Railroads in the United States with Home Address of Each
Growth of Railway Mileage in the United States, by States and Years
Maps of the United States, Showing Railway Lines
Bibliography of Railway History
Train and Engine Books for Children
Interesting Facts About the American Railroads
Copper and Its Alloys on American Railways
By Rail
You and Your Railroads
The Railroad Land Grant Legend in American History Texts
Teacher's Kit — Railroad Transportation (available to teachers only)

Berkeley Models, Inc., 230 Steuben St., Brooklyn 5, N. Y.
Berkeley 1947–48 Handbook-Catalog on Model Airplanes, Race Cars, and Speed Boats (free to teachers)

Electric Storage Battery Co., Allegheny Ave. and 19th St., Philadelphia 32, Pa.
The Storage Battery: Its Fundamentals, Use and Maintenance

Firestone Tire & Rubber Co., Akron 17, Ohio
Firestone Research
Velon and Foamex
How Firestone Tires Are Made
Rubber
Royal Jupiter — Grand Champion
Facts About Firestone Contro Elastic Yarn

Ford Motor Co., 3000 Schaefer Road, Dearborn, Mich.
He Measured in Millionths — Story of C. E. Johansson
Industries Within an Industry
The Ford Rouge Plant
How to Be an Expert Driver

Frisco Lines, Traffic Dept., St. Louis 1, Mo.
Mineral Wealth in the Frisco Belt — Oklahoma
Mineral Wealth in the Frisco Belt — Missouri
Mineral Wealth in the Frisco Belt — Arkansas

General Motors Corp., Detroit 2, Mich.
Power Goes to Work
A Power Primer
Airplane Power
When the Wheels Revolve
We Drivers
Transportation Progress
Optics and Wheels
Chemistry and Wheels
ABC's of Hand Tools
Electricity and Wheels
Diesel, the Modern Power
Metallurgy and Wheels
General Motors Users Guide
Research Looks to New Horizons
Short Stories of Science and Invention

General Motors Corp., Aero Products Division, Municipal Airport, Dayton, Ohio
Aeroprop Constant Speed Propellers, APD-3
The Aeroproducts Propeller — Model A422F Series

General Motors Corp., Buick Motors Division, Flint 2, Mich.
Buick Shop Manual
Your 1947 Buick
Know Your Buick

Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.
Cosmetic Manual

Goodyear Tire and Rubber Co., Akron, Ohio
The Story of the Airship, Non-Rigid — 50 cents
The House of Goodyear — $1

Lee Rubber and Tire Corp., Conshohocken, Pa.
Factfinder Talk on Rubber

Link Aviation Devices, Inc., Binghamton, N.Y.
Map Reading and Dead Reckoning Trainer
The Connecting Link (periodical)
Instrument Trainer — Model 45
Test Collimator
Crew Navigation Trainer
Bubble Sextant
Instrument Flying Trainer
Aviation Education — Teachers' Guide — 55 cents
Fundamentals of Aviation — 35 cents

National Planning Association, 800 Twenty-first St., N.W., Washington 6, D. C.
The Outlook for Synthetic Rubber — 25 cents
World Needs for U. S. Food and Fiber — 50 cents
Regional Resource Development — 25 cents
The Outlook for Domestic Air Transport — 25 cents
Public Policy Digest — 25 cents
Obstacles to Multilateral Trade — 25 cents
The Future of German Reparations — 50 cents
Dare Farmers Risk Abundance? — 25 cents
The Big Four in Germany — 50 cents
Recovery in Europe — 25 cents
The Role of Business in Orderly Price Adjustments
Goals of Bipartisan Foreign Policy — single copies free; quantity orders, $3 a hundred
Strengthening the Congress: A Progress Report — 25 cents
America's World Food Responsibilities — single copies free; quantity orders, $2 a hundred
Goals of Cooperation: A Declaration of Interdependence — single copies free; quantity orders, $5 a hundred
A Declaration of Interdependence
Causes of Industrial Peace Under Collective Bargaining
Report to Members on NPA's Joint Meeting
NPA Committee of the South, Initial Meeting, Birmingham
NPA Notes. . . Goals of Cooperation — and Ways to Reach Them
National Policy for Aviation — 50 cents
International Economic Collaboration — 25 cents
A Retirement System for Farmers — 25 cents
A Farmer Looks at Fiscal Policy — 25 cents
Farms for Veterans — 25 cents
A Food and Nutrition Program for the Nation — 25 cents
Fiscal Policy for Full Employment — 25 cents
National Budgets for Full Employment — 50 cents
Fertilizers in the Postwar National Economy — 25 cents
Stabilizing the Construction Industry — 25 cents
China's Relief Needs — 25 cents
America's New Opportunities in World Trade — 50 cents
Europe's Uprooted People — 25 cents
Fiscal and Monetary Policy — 25 cents
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Joint Statement on Social Security — 25 cents
Discussion and Study Outline on Social Security — 15 cents
UNRRA: Gateway to Recovery — 50 cents
Food for Europe After Victory — 25 cents
Farm People and the Land After the War — 25 cents
Business Reserves in Present Tax Law — 25 cents
Reconversion of Industry to Peace — 25 cents
Public Thinking on Post-War Problems — 25 cents
The Outlook for Domestic Air Transport — 25 cents
Business Reserves for Post-War Survival: Their Impact on Capital Adjustments — 50 cents
Economic Pattern of World Population — 25 cents
Relief for Europe — 25 cents
International Development Loans — 25 cents
When Demobilization Day Comes — 25 cents
The Postwar Industrialization of China — 50 cents
For a Better Post-War Agriculture — 25 cents
Urban Development and Housing — 25 cents
Guides for Post-War Planning — 25 cents
War and Our Latin American Trade Policy — 25 cents
Relief and Rehabilitation Kit — $1.75; and *Discussion Guide* — 15 cents
America Must Help Feed Europe This Winter — 10 cents
A National Employment Service — 5 cents
Recommendations on National Aviation Policy — 10 cents
4 for 4: Questions for National Action — 25 cents
The V-Day Problem of Military Aircraft Procurement — 10 cents
The Food and Agriculture Organization — 15 cents
The Stakes of Bretton Woods — 25 cents
Corporate Income Taxes During the Transition From War to Peace — single copies free; additional copies 5 cents each
Latin America in the Future World — $3.50; special price of $2.40 to NPA members
German Strategy of World Conquest — $2.50; special price of $1.85 to NPA members
National Policy for Radio Broadcasting — $1

Foundations of American Population Policy — $1.50
Planning by Americans in Agriculture, Business, Labor, Government

New York Central System, 466 Lexington Ave., New York, N. Y.
Road to Progress — Story of NYC System
Grand Central Terminal NYC
Coal-Burning Steam Locomotives on the New York Central System

New York Times, Times Square, New York 18, N. Y.
The Weather — How and Why — 10 cents

Nitragin Co., Inc., 3747 N. Booth St., Milwaukee 12, Wis.
Inoculated Legumes for Better Farming

Norfolk and Western Railway Co., Roanoke, Va.
The Story of Fuel Satisfaction (transportation of coal)
Along the Right of Way

Pennsylvania Grade Crude Oil Assoc., Oil City, Pa.
How Pennsylvania Oil Is Made — 1 cent
Pennsylvania Oil Salesman's Handbook — 75 cents
Pay to the Order of You
Col. Drake's Petrolia Flourishes

The Pennsylvania Railroad, Publicity Dept., 1617 Pennsylvania Blvd., Philadelphia, Pa.
Train Talks

Piper Aircraft Corp., Lock Haven, Pa.
What Your Town Needs for the Coming Air Age — 10 cents
The Cub Flier — bimonthly publication
How to Fly a Piper Cub — 10 cents
A Plan for Flying Club Organizations — 10 cents
How to Organize a Flying Club — 10 cents

The Pullman Co., Pullman Bldg., 79 East Adams St., Chicago 3, Ill.
Pullman Accommodations
Behind Your Pullman Ticket
Pullman Progress
Duplex Roomette

Radio Receptor Co., Inc., 251 West Nineteenth St., New York 11, N. Y.
Highways of the Air

Railway Express Agency, Inc., Dept. of Public Relations, 230 Park Ave., New York 17, N. Y.
Air Express Shipping Estimator
Why You Can Ship by Air Express More Than Ever Before
Pioneers in Transportation
The Pony Express and Its Offspring
Speed (booklet on air express)

Square D Company, Kollsman Instrument Division, Elmhurst, N. Y.
Facts About Kollsman Aircraft Instruments

The Studebaker Corp., South Bend 27, Ind.
The Case of the Missing Mile

Towmotor Corp., Cleveland 10, Ohio
Lift Truck Operators Guide
Materials Handling Analysis Guide

Union Pacific Railroad Co., Public Relations Dept., 1416 Dodge St., Omaha 2, Nebr.
Union Pacific Railroad
Along the Union Pacific Railroad

United Air Lines, School and College Dept., 5959 S. Cicero Ave., Chicago 38, Ill.
Your Future in the Age of Flight (high school)
Our New Age of Flight (intermediate grades)
Air-Transportation — Jobs and You (high school)
Seeing the Airport (primary grades)
Mike and Nancy at the Airport (primary)
How Representative Grade Teachers Are Teaching Aviation
Elementary Bibliography (grade teachers)
High School Bibliography (high school teachers)
Air Freight Picture Set (high and junior high school)
History of Mail Picture Set (elementary and high school)
M-300 Picture Set (elementary and high school)
Air Transportation Booklet (junior and senior high school)
Directory (teachers)

United States Department of Commerce, National Bureau of Standards, Publications Section, Washington 25, D. C.
Quality Guaranteeing Labeling Plan
Aid for Over-the-Counter Buyers
The Certification Plan, Its Significance, Scope, and Application to Selected Federal Specifications
List of publications of interest to the general public
National Bureau of Standards Technical News Bulletin — $1 yearly subscription

Waco Aircraft Co., Troy, Ohio
North American's Two Big Gliders — 10 cents
The Waco Aircraft Company's History — 10 cents

Willard Storage Battery Co., 246–286 E. 131st St., Cleveland 1, Ohio
Starting and Lighting Battery
The Nerve Center of Ten Million Cars
The A.A.B.M. Battery Service Manual

(*To be continued*)

LITTLE THINGS

LEONARD E. SCHMIDT
Lincolndale, N. Y.

Do not ever feel disgruntled,
With what you think fate has in store,
If the other fellow's grass seems greener,
Perhaps it's 'cause he waters more.

You can't expect things to come easy,
The biggest deeds take lots of work,
And big things you can never do
If the little ones you often shirk.

Habits are formed while you are young,
By the simple things you do;
The paper that you stoop to pick up —
A tidy workbench when you're through.

They all add up to form the pattern
That makes us what we are,
And they determine if we stand still,
Or if we are to go far.

So each day do some little good thing,
It's quite an easy plan,
And the little things will soon add up,
And make of you a man.

Cutting pipe at the Hobart Trade School, Troy, Ohio
— Courtesy, Hobart Brothers Co., Troy, Ohio

Industrial Arts and Vocational Education
John J. Metz, Editor

TESTS AND TESTING

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION again has been devoted to tests, and a number of them on various subjects appear in its pages. The tests that have been selected for publication may not be the best that can be found or constructed. They do, however, show that some teachers have constructed tests and are using them.

The appearance of the tests in this magazine is to popularize their use, and to afford an opportunity to examine test items which some shop teachers have produced and used to find out what their students acquired while they were taking a particular shop course.

It is hardly to be expected that readers who look over the various tests presented will agree on the value of all of the items in any given test. They will, however, find some that will answer their requirements, and by combining the items from several tests they can build up usable tests for their own use with a minimum expenditure of time and energy.

Probably the method described on pages 240 to 242 in the June, 1939, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, under the title "Card-File Test Building" by Homer C. Rose and Roy R. Van Duzee, will be found very helpful by busy teachers who may not have as much time at their disposal as they might desire for preparing their own tests.

For the sake of those readers who do not have the opportunity to refer to the article just mentioned, the following abstract is made, giving due credit to the authors mentioned. Readers are again advised that it is permissible for them to copy anything that appears in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, and to duplicate it in any manner they see fit, for use in their shops and classrooms.

To proceed then to build up a test file, type all suitable test questions on cards, one question to a card, and file them under such headings as true-false, completion, multiple choice, identification, etc., and under subject-material headings such as: general metal, electricity, woodwork, drafting, plastics, ceramics, and the like. The answer to each question should appear at the bottom of the card. Be sure, also, that each card has a heading which permits its return to the file from which it was removed.

Then set up standard sets of general directions for writing the various types of tests, and type them separately on cards.

When the time has come to construct a test, take all true-false cards for the given course from the file and divide them into two piles, the one containing those that are to be used, and the other those that are not suitable for the test that is being prepared.

Go through the selected cards and eliminate the least desirable questions until the pile has been reduced to the number of test items wanted.

Then repeat this process for the other types of questions on the subject, and finally arrange the questions in a desired order and add a direction card for each type of question.

The cards can then be turned over to a typist with the request to type out the test and also an answer sheet.

With such a test file on hand, a good 100-question test can be organized in less than half an hour, and by adding other items to the file whenever new tests are found, the material will always be fresh and up to date.

For a good selection of tests, go back over the volumes of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION for the past five years. In the 1943 volume you will find 20 such tests; in 1944, 5; 1945, 19; 1946, 7; and in 1947, 22.

It may also be well to look over the article "Writing Objective Tests for Shop Instruction" by Frank C. Moore and William R. Mason, May, 1943, page 203; also the series of articles on "Construction of Written Achievement Tests" by William J. Micheels and M. Ray Karnes, September, 1943, page 269, and October, 1943, page 307.

Another useful article is the one entitled "Constructing Achievement Tests" by Donald K. Beckley and Leo F. Smith, February, 1945, page 300.

All of this extra work on tests and testing may be burdensome, but in the end it will be found to be very helpful.

OUR ADVANCING CIVILIZATION??

At the New York World's Fair in 1939, an eight hundred pound Cupaloy shell, containing a ten-million word "Story of Civilization" to give people living five thousand years hence a picture of how we live today, was buried deep into the earth with great solemnity.

At that time we knew nothing of the atom bomb nor of its effect. It might be well if that "Story of Civilization" be unearthed again and revised so that future generations could get a good, firsthand account of how efficient we had become at destroying civilization, and how inept we of the twentieth century were at making peace not only with our former enemies but also with those whom we assisted and even armed so that they could carry on the defense of their own country, while they were undermining our own government.

It is well, also, to remember that atomic energy may not, according to some of the scientists who know most about it, be as helpful to our economic, social, and industrial life, as we have been led to believe. At least, atomic energy is not to be looked upon as a source of power which can be safely used. It may probably be tamed down to serve as a huge reservoir of energy, but it may also have a detrimental effect on the health of all who come within the vicinity in which it is being used.

Realizing then that our civilization has not advanced to such a great extent, even though we have made huge strides in the development of science and industrial processes, would it not be well for education and educators to take a humble and searching attitude in studying their own contribution in furthering the welfare of mankind?

Just how much has education contributed to the conditions which brought about World War I and II? How much has it combated the foreign ideologies that are threatening to rob us of our God-given rights and liberties? Can we as shop teachers do something about it? Can we help employer and employee to work more amicably together?

Helping our civilization to advance is surely one of the objectives of education. Is it not time for all educators to do something about it? Let's make a good start at it during 1948.

Testing and Tests

TEST FORMS FOR USE IN RETAIL SELLING

DONALD K. BECKLEY

Director, Prince School of Retailing

Simmons College

Boston, Mass.

Retail selling has consistently proved to be one of the areas in vocational education in which achievement is most difficult to measure through tests. One of the explanations for this doubtless is that we do not yet know precisely what qualities or what factors are required in the good salesperson. Hence we do not know definitely what factors should be taught and then measured through examinations. There is also the difficulty that arises in many other areas of vocational education: constructing a testing situation that will measure practical application of the material taught. Although there is not as yet any one *best* testing technique for retail selling, it may be that illustrations of several kinds of test situations applicable in measuring achievement in a selling course may be of interest.

Using the True-False Item

Probably the simplest test form for use is the true-false item, which can appropriately be used to find out whether or not a student recognizes a correct statement of fact relating to selling. Hence the following directions and items might be used to measure correct identification of selling principles and approved selling practices:

Directions: Read each of the following statements carefully and consider it from the viewpoint of whether it represents *good or poor selling technique*. Then mark the statement *T* if it represents good selling technique and is true; *F* if it represents poor selling technique and is false.

( ) 1. To many customers, the personal qualities of the salesman may be as important as the physical qualities of the goods.

( ) 2. Most people are as readily convinced about a product through hearing it described as through seeing it in action.

( ) 3. The same product may appeal to several people for widely different reasons.

( ) 4. You should never concede the superiority of a competing product in any respect.

A variation on the true-false item appropriate for use particularly when the test papers are to be returned to the student for review purposes, is described in the following directions:

Directions: This is a true-and-false examination which is different from most of those you have been accustomed to taking. In the following statements you are to write the word *true* after those statements which you believe to be correct. However, in the case of those which are incorrect, you are to write the word *false* and immediately following this you are to make the statement correct by altering the predicate. You will not be given credit for inserting the word *no* or *not;* but must make the necessary corrections by rewriting the incorrect part of the statement.

Then following each statement, adequate blank space should be provided for the writing of any needed corrections. Obviously, there may be a variety of correcting statements possible in those items which are false. One method of scoring to be recommended is to give one credit for statements correctly identified (i.e., a *true* statement marked *true* and a *false* statement marked *false* but not properly corrected), and two credits for false statements identified and properly corrected. No credit, of course, would be given for those incorrectly identified.

Using the Multiple-Choice Item

Multiple-choice items of various types have frequently been used in tests of achievement in retail selling, and this form is useful for identification of selling principles and the proper application of these principles, as well as for measuring other objectives such as acquisition of information. In this type of test the student must select the right phrase, words, or clause which will correctly complete the statement. Three examples of items of this form that have been used follow:

1. The most effective type of sales presentation for most prospects is:
   a) Seeing a demonstration of the product in use.
   b) Listening to a sales talk by a salesperson.
   c) Reading advertising material concerning the product.
   d) Reading testimonials of satisfied users.
2. If it becomes necessary to comment about a competitor's goods, the best practice is:
   a) To speak respectfully of them, and admit the good features they have.
   b) To laugh about them, and pass it off as a joke.
   c) To quote examples of poor performance by competitor's products.
   d) To state that you know nothing at all about them.
3. Suggestive selling means that the salesperson suggests:
   a) The desirability of the product under consideration.
   b) The advisability of prompt purchase.
   c) The purchase of related products.
   d) The many uses for the product being described.

Measuring Reasons as Well as Reactions

One of the limitations in the use of multiple-choice items is that the student may answer the item correctly for the wrong reasons. Thus he may select the correct application of a principle, but do so through mental processes involving the entirely erroneous application of an inappropriate principle. While in an actual work situation it might be claimed that a person who knows what to do should not necessarily need to know precisely why he does it, obviously a thorough teaching situation requires an understanding of the processes involved. Hence a type of multiple-choice item has been developed which asks both what to do and why to do it. An example with directions may serve to illustrate this test form:

Directions: Below is stated a situation which you are apt to encounter on the job together with several possible reactions. After reading the situation, check your reaction and all reasons which you believe support your decision.

You have recently been hired as a salesperson, and though given training in writing saleschecks and other store system, you find that about once a day you do not definitely know how to record a transaction because of its unusual nature. What would you do?

Reaction

1. Ask a fellow employee.
2. Check with the supervisor.
3. Try to puzzle it out for yourself after studying store manuals.
4. Make out the salescheck to the best of your ability and send it through.

Reasons to Support Your Reaction

1. By asking the superior, one would be admitting his own weakness.
2. Seeking assistance from a fellow employee would be a subtle means of flattery.
3. The superior would want to know in what respects the training of new employees was inadequate.
4. Fellow employees might think you were trying to get in good with your superior.
5. By puzzling it out for yourself you would be developing your own initiative.
6. The superior would be most likely to give the correct answer.
7. If a person recorded a transaction to the best of his ability and sent it through, no one would ever know the difference.
8. The superior might suggest rather curtly that the answer could be found in the manual of procedure.
9. During the training period all new employees were instructed to seek the superior's advice in the case of any question of store policy or procedure.
10. By going to manuals one would most likely get the correct answer without bothering anyone.

There are many other reasons that might be listed here to provide a good sampling of student thought processes in arriving at a reaction or conclusion. In effect, the student is asked to make a decision on a problem, and then is asked to explain or justify that proposed solution.

Actually, this test form is difficult to construct, and much work was done at the Rochester Institute of Technology several years ago in attempting to develop a workable test using items such as the foregoing. There are a number of problems involved, yet this test form seems potentially very useful for retail-selling purposes. Details of its use in other fields can be found in the publications of the "Eight-Year Study at the University of Chicago."*

The Sales Interview

Another type of test item for use with students of retail selling attempts to set up closely as possible continuous actual selling situations, and to ask the student to comment on it at various stages in the procedure. The following sales interview relates to outside selling, and could readily be adapted to a retail store situation:

Directions: Read the description of the following printed sales conversation. After the description of the conversation are listed a number of brief comments concerning the sales technique described. Indicate by checking the appropriate letter the comment in each group which most closely represents your idea of the method by which the transaction should be handled.

1. When called on at his farm, Adams (the prospect) told Brown (sales representative) that he saw no point in taking up time talking about purchasing farm equipment. He said that market conditions were so uncertain that he could not risk investing any money now. Brown suggested that in spite of unsettled conditions it might be desirable to talk over Adams' machinery needs.
   a) A good approach.
   b) Brown should have shown Adams that present conditions are no more uncertain than in most other years.
   c) Brown should have left and planned to call again when Adams was more optimistic about the future.
2. Brown proceeded to explain what products the company made and to illustrate he presented the features of each of the tractors.
   a) A good beginning.
   b) Brown should have found out about Adams' needs before describing products.
   c) It would have been better to begin by describing a different product made by the firm.
3. Adams explained that he did his own work the way he thought best. He found his pair of horses to be satisfactory and saw no reason to change to a tractor. Brown told him that using horses was rapidly going out of date and that modern, progressive farmers all used tractors.
   a) A good way to put across the point.
   b) A poor technique — Brown should present proof of the desirability of the tractor as compared with horses.
   c) Wrong approach — Brown should concede usefulness of horses, and try to sell some other product.
4. Adams stated that his farm was a small one — only 65 acres — and was planted largely in small and irregularly shaped fields of hay, oats, and corn. Brown first described to him the tractor *A* as ideally suited to his needs.
   a) A good approach.
   b) The tractor *B* would have been a better choice.
   c) Adams does not seem to need a tractor; Brown should suggest another company product.
5. Adams showed interest and asked Brown how a tractor could save him money in his own particular situation. Brown explained that the tractor he needed operated on from 7 to 10 gallons of fuel per day.
   a) This is the best answer.
   b) Brown should have stressed the tractor's specifications such as r.p.m.'s and cylinder bore.
   c) Brown should explain the low operating cost, speed, and ability to do any work that horses can do.
6. Adams said he thought it would be desirable to have a tractor but did not see how he could afford one now. He thought he might be interested next year. Brown said he wanted to explain in detail the specifications of the tractor so that Adams could see how good it was.
   a) A good technique. The prospect should be given all the facts possible.
   b) Brown should leave and plan to see Adams next year.
   c) Brown should stop trying to sell a tractor and should switch to another product in which Adams might be interested.
   d) Brown should attempt to present the features of the tractor in such a way that Adams sees he cannot afford to wait another year to consider purchase.
7. Adams told Brown that a representative of competing company *A* had been to see him recently and seemed to have a good tractor also. Brown told Adams that the *A* tractor was a good one, but described the points on which the tractor he was selling was superior.
   a) A good way to handle the situation.
   b) Brown should have told Adams that his tractor was better in every respect.
   c) Brown should have said nothing at all about *A* but should have concentrated all the more on the features of his tractor.

The sales interview test form as shown above has, like most forms, certain weaknesses. Yet it comes closer to re-creating an actual sales situation than the traditional use of multiple-choice items. A better method would be to have students listen to a recording of a sale being made, or even better, see a sound motion picture or slide strip of such a situation. Questions relating to the film could be distributed to the students in some objective form, and answered while the picture was being shown or immediately afterward.

Obviously, much yet remains to be done to make achievement testing in retail selling as effective as it should be, and much can be learned about good teaching techniques and also about factors needed in good selling through test investigation. Possibly the test forms just described can serve to suggest areas teachers in this field might profitably explore.

*E. R. Smith and R. W. Tyler, "Appraising and Recording Student Progress" (New York: Harper and Bros., 1942).

ACHIEVEMENT TEST — CARPENTRY

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This test is designed to measure the achievement of students in a vocational carpentry course. It must be remembered that the range of such a course is so wide that no one test can be expected to fully measure its content. A battery of tests covering the various units of the course would probably be the answer for a really comprehensive trade examination. This test, however, attempts to measure in a general way what the student is expected to know.

The course objectives are summed up as follows:

1. To prepare the students for entrance into the trade with advanced standing.
2. To develop skills in the use of the trade tools.
3. To acquaint the student with related trade subjects.
4. To develop an appreciation for good materials and workmanship.
5. To instill worthy personal traits, attitudes, and habits such as honesty, industry, fair play, and co-operation.

General Directions: This is a test of your general knowledge of carpentry. Do not waste time on any item that you do not know. If you have time before the period ends, review your work and answer any items that you have omitted. Specific directions are given for each part.

Part I. Multiple-Choice

Directions: Each of the incomplete statements listed below is followed by several words, phrases, or numbers. From these choose the one which, when added to the incomplete statement, gives a *true* statement. Place the letter of that word or phrase (*a*, *b*, *c*, *d*, or *e*) in the brackets to the left of the item. The first item is answered as an example.

(*d*) X. Nails are sold by the (*a*) quire, (*b*) dozen, (*c*) gross, (*d*) pound.

( ) 1. The growth of a tree is indicated by the (*a*) medullary rays, (*b*) annual rings, (*c*) thickness of the bark, (*d*) height of the tree.

( ) 2. When fastening boards, the nails should be driven (*a*) in line with the grain, (*b*) in line across the grain, (*c*) staggered, (*d*) the handiest way.

( ) 3. The nail that would commonly be set below the surface is a (*a*) common nail, (*b*) box nail, (*c*) finishing nail, (*d*) casing nail.

( ) 4. The countersink is used for (*a*) drilling holes in hardwood, (*b*) setting the heads of screws, (*c*) setting nails, (*d*) making holes larger.

( ) 5. The part of the brace into which the tang of a bit fits is called the (*a*) ratchet, (*b*) chuck, (*c*) socket, (*d*) collar.

( ) 6. The tool which can be adjusted to bore various size holes is called (*a*) adjustable bit, (*b*) expansive bit, (*c*) extension bit, (*d*) twist drill.

( ) 7. The plane iron cap can be removed by first releasing the (*a*) cap iron, (*b*) adjusting nut, (*c*) lateral adjusting lever, (*d*) cam lever.

( ) 8. When planing end grain, use the (*a*) jack plane, (*b*) block plane, (*c*) smoothing plane, (*d*) jointer plane.

( ) 9. When sawing a board, saw (*a*) on the line, (*b*) on the inside of the line, (*c*) on the outside of the line, (*d*) on the waste side of the line.

( ) 10. Squaring up stock means (*a*) squaring the ends, (*b*) squaring the edges, (*c*) smoothing the surfaces, (*d*) all of the above.

( ) 11. To saw a curve in a piece of ¾ inch stock use a (*a*) backsaw, (*b*) hack saw, (*c*) coping saw, (*d*) compass saw.

( ) 12. Number *5* stamped on the shank of an auger bit indicates that the size is (*a*) 5/16 in., (*b*) 5/32 in., (*c*) 5/64 in., (*d*) ⅝ in.

( ) 13. The finest grade of sandpaper listed here is (*a*) 3/0, (*b*) ½, (*c*) 1, (*d*) 3.

( ) 14. In estimating the number of board feet in a pile of lumber use (*a*) a framing square, (*b*) a yardstick, (*c*) a lumberman's rule, (*d*) a steel tape.

( ) 15. The inch is divided into various fractional parts; which one of the following *is not* found on your rule (*a*) fourths, (*b*) halves, (*c*) eighths, (*d*) tenths, (*e*) sixteenths.

( ) 16. Which one of the following tables *is not* found on the framing square: (*a*) board measure, (*b*) brace measure, (*c*) octagon measure, (*d*) square measure?

( ) 17. The length of a 10 penny nail is (*a*) 2 inches, (*b*) 2½ inches, (*c*) 3 inches, (*d*) 3½ inches.

( ) 18. The unit of measure for figuring excavation is (*a*) lineal feet, (*b*) square feet, (*c*) cubic feet, (*d*) board feet.

( ) 19. One-half scale means that each half inch on the drawing represents how much on the building: (*a*) ½ inch, (*b*) 1 inch, (*c*) 1 foot, (*d*) 1 yard?

( ) 20. A board foot is 1 inch thick, 12 inches wide and (*a*) 1 inch long, (*b*) 6 inches long, (*c*) 12 inches long, (*d*) 18 inches long.

( ) 21. A board 2 in. by 10 in. by 18 ft. contains (*a*) 18 board feet, (*b*) 20 board feet, (*c*) 30 board feet, (*d*) 36 board feet.

( ) 22. A board 1 in. by 4 in. by 12 ft. contains (*a*) 3 board feet, (*b*) 4 board feet, (*c*) 6 board feet, (*d*) 12 board feet.

( ) 23. If ten penny nails cost $3 per hundred pounds, 35 pounds will cost (*a*) 10½ cents, (*b*) $1.05, (*c*) $10.50, (d) $105.

( ) 24. If six penny nails cost 5½ cents per pound, 23 pounds will cost (*a*) 13 cents, (*b*) $1.26½, (*c*) $1.36½, (*d*) $12.65.

( ) 25. The cost per foot of lumber at $185 per thousand is (*a*) 018½ cents, (*b*) 18½ cents, (*c*) $1.85, (*d*) $18.50.

( ) 26. When estimating 1 by 3-in. flooring we should allow for waste (*a*) 15 per cent, (*b*) 20 per cent, (*c*) 25 per cent, (*d*) 33 1/3 per cent.

( ) 27. Which one of the following types of subflooring is the most economical? (*a*) random width, (*b*) uniform width, (*c*) matched, (*d*) end matched?

( ) 28. A square, when referring to surface area, means a surface that contains (*a*) 1 square foot, (*b*) 10 square feet, (*c*) 100 square feet, (*d*) 1000 square feet.

( ) 29. The strongest type of frame wall is one (*a*) sheathed diagonally with no braces, (*b*) sheathed horizontally with 2 by 4-in. braces cut in between the studs, (*c*) sheathed horizontally with 1 by 6-in. braces let into the studding, (*d*) sheathed vertically with diagonal bracing.

( ) 30. Generally, air leakage through walls is eliminated through the proper use of (*a*) building paper, (*b*) sheathing, (*c*) siding, (*d*) insulation.

( ) 31. Which one of the following moldings *is not* used in interior trim: (*a*) backband, (*b*) drip cap, (*c*) shoe molding, (*d*) window apron.

( ) 32. In interior trim the coped joint is best for (*a*) picture molding, (*b*) window casing, (*c*) doorstop, (*d*) baseboard.

( ) 33. When hanging an interior door use a (*a*) T hinge, (*b*) loose pin butt, (*c*) door hanger, (*d*) strap hinge.

( ) 34. House plans are generally drawn to (*a*) ⅛-inch scale, (*b*) ¼-inch scale, (*c*) ⅜-inch scale, (*d*) ½-inch scale.

( ) 35. Before a builder can start a house, he must first (*a*) prepare the foundation, (*b*) see an architect, (*c*) see the building inspector, (*d*) secure a building permit.

( ) 36. The building code is (*a*) building regulations, (*b*) a code among builders, (*c*) specifications, (*d*) workmen's compensation.

Part II. Cluster True-False

Directions: Each of the incomplete statements below is followed by several items, each of which will complete the statement and make it either true or false. Place a plus (+) in the blank space to the left of each item that makes a true statement. Place a zero (0) in the blank space to the left of each item that makes a false statement. The first item is answered as an example.

A good material for finishing floors is:

\+ X. yellow pine

..... 37. white pine
..... 38. cedar
..... 39. maple
..... 40. oak
..... 41. cypress

In making a mortise-and-tenon joint you would need a:

..... 42. jointer ..... 45. backsaw
..... 43. chisel ..... 46. mallet
..... 44. hammer

A formula for finding board measure is:

..... 47. $\frac{T'' \times W'' \times L''}{12}$
..... 48. $\frac{T'' \times W'' \times L'}{12}$
..... 49. $\frac{T'' \times W'' \times L''}{144}$
..... 50. $\frac{T'' \times W'' \times L'}{144}$
..... 51. $T'' \times W' \times L'$
..... 52. $T'' \times W'' \times L''$

To find the length of a rafter we need to know:

..... 53. the pitch of the roof
..... 54. the length of the roof
..... 55. the span of the roof
..... 56. the rise of the roof
..... 57. the width of the roof

There are 12 board feet in the pieces of lumber of the following dimensions:

..... 58. 2 pcs. 2″ x 6″ x 6′
..... 59. 6 pcs. 1″ x 3″ x 12′
..... 60. 3 pcs. 1″ x 4″ x 12′
..... 61. 12 pcs. 1″ x 6″ x 2′
..... 62. 4 pcs. 1″ x 12″ x 8′

Part III. Modified True-False

Directions: Some of the following statements are true and some are false. If the statement is true, encircle the *T* at the left and *do no more*. If the statement is false, encircle the *F* and *do two more things.*

1. In blank *a* insert one word that makes the statement false.

2. In blank *b* insert one word that would make it true.

Do not use the words that are italicized. The first item is inswered as an example.

T(F)X. *Oil rags and waste should be* placed in a trash container. (*a*) *trash* (*b*) *metal*

T F 63. The nails most commonly used for *interior trim are called common nails.* (*a*) .....(*b*) .....

T F 64. The *general purpose plane in the shop is* the jack plane. (*a*)..... (*b*) .....

T F 65. To prevent a saw from binding the teeth are sharpened. (*a*) ..... (*b*) .....

T F 66. The part of an auger bit that pulls it through a board *is* called the nibs. (*a*) ..... (*b*).....

T F 67. The cut made by a saw *is* called a kerf. (*a*) ..... (*b*) .....

T F 68. To measure a surface accurately with a rule, the rule *should be* laid flat. (*a*) ..... (*b*) .....

T F 69. When driving a wood chisel, one *should* use a mallet. (*a*) ..... (*b*) .....

T F 70. The unit of board measure *is* the square foot. (*a*) ..... (*b*) .....

T F 71. Clinched nails *hold better when they are* bent across the grain. (*a*) ..... (*b*) .....

T F 72. When wood is dried in a compartment by hot air *it is said* to be "air dried." (*a*) ..... (*b*) .....

T F 73. A narrow strip of board used to fasten several pieces together *is* called a batten. (*a*) ..... (*b*) .....

T F 74. The *support for the second floor joists in a balloon frame is* called a girder. (*a*) ..... (*b*) .....

T F 75. The framework which holds glass in window *is* called a sash. (*a*) ..... (*b*) .....

T F 76. *Planing entirely* across the end of a piece of stock *is* likely to split the corner. (*a*) ..... (*b*) .....

T F 77. A piece of stock *1″ x 6″ x 12′ contains* 12 board feet. (*a*) ..... (*b*) .....

T F 78. A groove cut across a board *is* called a dado. (*a*) ..... (*b*) .....

T F 79. *Molding is* sold by the square foot. (*a*) ..... (*b*) .....

T F 80. The *marking* of a piece of wood to provide for the fitting of one of its *edges* to the irregular surface of another *is* called gauging. (*a*) ..... (*b*) .....

Part IV. Completion

Directions: In the blank space write in the word that completes the meaning of each statement. The first item is answered as an example.

X. The part of a try square which contains the parts of an inch is called the *blade.*

81. The number of an auger bit for boring a ½-inch hole should be number .....
82. The kind of wood very popular for wood paneled walls is .....
83. The standard width dimension for materials such as wallboards and plywood is ..... feet.
84. If a plan is drawn to a scale of one-quarter-inch-equals-one-foot, the distance on the drawing that represents 32 feet is actually ..... inches long.
85. On blueprints, the representations of objects and materials are called .....
86. When all parts of a roof have the same ratio and relation it is said to be ..... pitch.
87. The pitch of a roof, when the rise is 8 feet and the span is 24 feet, is .....
88. The template used for laying out stair carriages is called a .....
89. The floor space at the head or foot of a flight of stairs is called a .....
90. The piece on which the elevation of risers is laid off is called a .....
91. The general spacing for studding is ..... inches on center.
92. The size of a dressed 2 by 4 in. is .....
93. The written directions regarding the details of a building are the .....
94. The drawings which are made as though the observer were looking straight at the object are .....
95. A piece of plywood 24 by 42 in. contains ..... square feet.

Directions: In the statements below, certain key words have been omitted. The words or phrases that fit into the blank spaces are included in the lettered list that follows the statements. Select the word that best fits in each blank and place its letter in the appropriate space. The first statement is filled in as an example.

X. The single slope form of roof is the *I*
96. The type of roof most commonly used and which has a double slope is the .....
97. The type of roof that slopes up toward the center from all sides is the .....
98. A roof which has two different pitches on one side of the ridge and always has a gable is the .....
99. The ..... of a roof is the proportion
100. that the ..... bears
101. to the ..... of the building.

a) gable roof
b) width
c) flat roof
d) pitch
e) hip roof
f) rise
g) gambrel roof
h) length
i) shed roof
j) run

102. After the foundation walls are ready, the first thing the carpenter does is set the .....
103. The next step is to set the .....
104. These are braced with .....
105. The fourth step is to start the .....
106. He is now ready to nail the ..... in place.

a) subflooring
b) studding
c) top plate
d) sole plate
e) bridging
f) floor joists
g) sills

Part V. Matching

Beneath each of the following groups of statements there is a list of related words or phrases. From these lists choose the words or phrases which are most closely related to each of the statements, and place their identifying letters in the spaces provided for them. The first statement is answered as an example.

I X. Flathead bright
..... 107. Used with a chisel
..... 108. Part of a plane
..... 109. Measurement for nails
..... 110. Used to drive nails
..... 111. Measuring tool
..... 112. Used for cutting metal
..... 113. Used for sawing curves
..... 114. Has a reinforced back
..... 115. For flathead screws
..... 116. For sawing with the grain
..... 117. A place to work
..... 118. A device for holding articles
..... 119. Roundhead blue
..... 120. Used for making round holes

a) Hammer, (*b*) mallet, (*c*) rule, (*d*) frog, (*e*) compass saw, (*f*) ripsaw, (*g*) penny, (*h*) countersink, (*i*) f.h.b., (*j*) auger bit, (*k*) vise, (*l*) hatchet, (*m*) backsaw, (*n*) hacksaw, (*o*) block plane, (*p*) bench, (*q*) r.h.b.

..... 121. Lumber undressed as it comes from the saw.
..... 122. Lumber dressed by planing.
..... 123. Lumber dressed and tongued and grooved.
..... 124. Lumber edge dressed to make a

close rabbeted or lapped joint.

..... 125. Lumber worked and shaped to a molded form.

a) surfaced, (*b*) matched, (*c*) rough, (*d*) shiplapped, (*e*) patterned, (*f*) beaded, (*g*) jointed.

..... 126. The lightest and most economical form of construction in which the studding runs in continuous lengths from the first floor line to the roof plate.

..... 127. The type of construction where each story is independently framed as decks.

..... 128. The old-fashioned mortised-and-tenoned frame.

a) balloon frame, (*b*) combination frame, (*c*) platform frame, (*d*) drop-girt frame, (*e*) braced frame.

..... 129. Extends at right angles from the plate to ridge.

..... 130. Extends diagonally from outside corner of plate to ridge.

..... 131. Extends diagonally from inside corner of plate to ridge.

..... 132. Extends from plate to hip at right angles to plate.

..... 133. Extends from valley to ridge at right angles to ridge.

..... 134. Extends from valley rafter to hip rafter.

a) hip rafter, (*b*) common rafter, (*c*) valley jack, (*d*) cripple rafter, (*e*) hip jack, (*f*) valley rafter, (*g*) show rafter.

..... 135. Drop siding

..... 136. Beveled siding

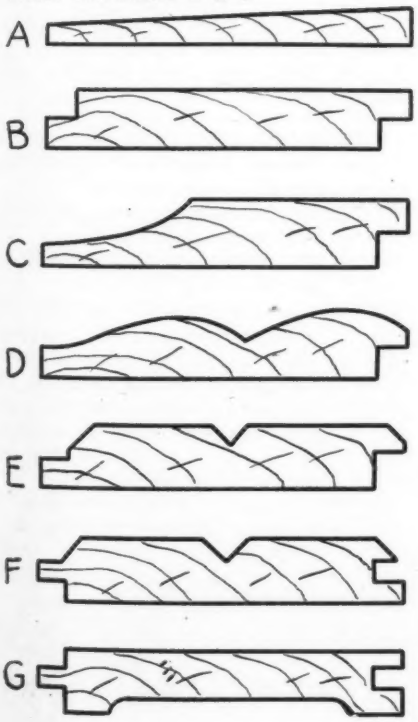
..... 137. Flooring

..... 138. Rustic shiplap

..... 139. Plain shiplap

..... 140. Novelty siding

..... 141. Rustic T & G

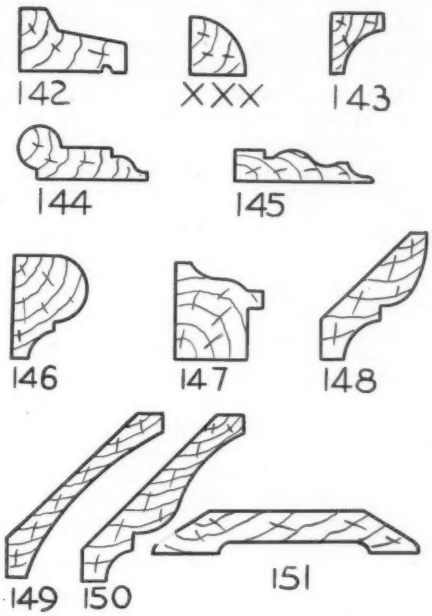


Part VI. Identification

Directions: Below is a list of standard moldings used in carpentry. Write the names of the moldings in the numbered spaces provided. The first item is answered as an example.

X. *quarter round*

142. ..... 147. .....
143. ..... 148. .....
144. ..... 149. .....
145. ..... 150. .....
146. ..... 151. .....

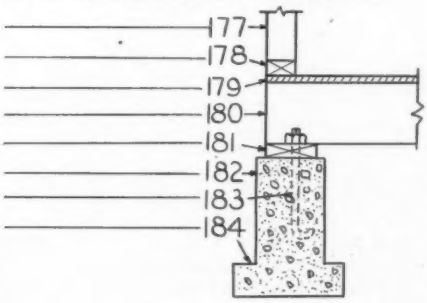


Listed below are a number of abbreviations used in carpentry. Write the item for which the abbreviation stands in the blank to the left. The first item is answered as an example.

average X. av.

..... 152. AD ..... 164. lgth.
..... 153. bd. ..... 165. M
..... 154. bdl. ..... 166. mldg.
..... 155. clg. ..... 167. qtd.
..... 156. com. ..... 168. rdm.
..... 157. cu. ft. ..... 169. rfg.
..... 158. dim. ..... 170. S&E
..... 159. flg. 171. S4S
..... 160. CM ..... 172. sel.
..... 161. csg. ..... 173. sq.
..... 162. KD ..... 174. std.
..... 163. lbr. ..... 175. wt.
..... 176. MR

In the blanks to the left, identify the parts of the detail to which the arrow points.



Part VII. Enumeration

Directions: Follow the directions given for each item.

On the lines below, list *in order* the operations necessary to properly fit (sharpen) a handsaw.

185. ..... 187. ..... 189. .....
186. ..... 188. .....

When a saw binds, the causes can be traced to one of four things. List the four causes below.

190. ..... 192. ..... 193. .....
191. .....

There is a great variety of scaffolds to meet the varied conditions encountered in building, with respect to method of support; they may be classed under four headings. List them below.

194. ..... 196. ..... 197. .....
195. .....

There are six rafter tables on the blade of the framing square. One is the "length of common rafters per foot of run." List the other five rafter tables on the lines below.

198. ..... 200. ..... 202. .....
199. ..... 201. .....

One of the places where most accidents occur in carpentry is on the scaffold. They have been summed up in five safety precautions to remember when building and using scaffolds. List those precautions on the lines below.

203. ..... 205. ..... 207. .....
204. ..... 206. .....

SCORING KEY

Part I

1. *b*	9. *d*	17. *c*	25. *b*	33. *b*
2. *c*	10. *d*	18. *c*	26. *c*	34. *b*
3. *c*	11. *d*	19. *c*	27. *d*	35. *d*
4. *b*	12. *a*	20. *c*	28. *c*	36. *a*
5. *b*	13. *a*	21. *c*	29. *a*	
6. *b*	14. *c*	22. *b*	30. *a*	
7. *d*	15. *d*	23. *b*	31. *b*	
8. *b*	16. *d*	24. *b*	32. *a*	

Part II

37. 0	43. +	49. +	55. +	61. +
38. 0	44. 0	50. 0	56. 0	62. 0
39. +	45. +	51. +	57. +	
40. +	46. +	52. 0	58. +	
41. 0	47. 0	53. +	59. 0	
42. 0	48. +	54. 0	60. +	

Part III

63. (F) (*a*) common (*b*) finishing
64. (T)
65. (F) (*a*) sharpened (*b*) set
66. (F) (*a*) nibs (*b*) spur
67. (T)
68. (F) (*a*) flat (*b*) on edge
69. (T)
70. (F) (*a*) square (*b*) board
71. (T)
72. (F) (*a*) air dried (*b*) kiln dried
73. (T)
74. (F) (*a*) girder (*b*) ledger board
75. (T)
76. (T)
77. (F) (*a*) 12 (*b*) 6
78. (T)
79. (F) (*a*) square (*b*) lineal
80. (F) (*a*) gauging (*b*) scribing

Part IV

81. eight
82. knotty pine
83. four
84. eight
85. symbols
86. equal

87. 1/3
88. pitch board
89. landing
90. story pole
91. 16
92. 1⅝ x 3⅝ in.
93. specifications
94. elevations
95. seven
96. *a*
97. *e*
98. *g*
99. *d*
100. *f*
101. *b*
102. *g*
103. *f*
104. *e*
105. *a*
106. *d*

Part V

107. *b*	114. *m*	121. *c*	128. *e*	135. *c*
108. *d*	115. *k*	122. *a*	129. *b*	136. *a*
109. *g*	116. *f*	123. *b*	130. *a*	137. *g*
110. *a*	117. *p*	124. *d*	131. *f*	138. *e*
111. *c*	118. *k*	125. *e*	132. *e*	139. *b*
112. *n*	119. *q*	126. *a*	133. *c*	140. *d*
113. *e*	120. *j*	127. *c*	134. *d*	141. *f*

Part VI

142. drip cap
143. cove (scotia)
144. picture molding
145. panel molding
146. nosing
147. backband
148. bed molding
149. cornice molding (cove)
150. crown molding
151. threshold (carpet strip)
152. air dried
153. board
154. bundle
155. ceiling
156. common
157. cubic foot (feet)
158. dimension (ed)
159. flooring
160. center matched
161. casing
162. kiln dried
163. lumber
164. length
165. thousand
166. molding
167. quartered
168. random
169. roofing
170. surfaced one side and one edge
171. surfaced four sides
172. select
173. square
174. standard
175. weight
176. mill run
177. stud
178. sole plate
179. subflooring
180. joist
181. sill
182. foundation wall (pier)
183. anchor bolt
184. footing

Part VII

185. Jointing
186. Shaping
187. Setting
188. Filing
189. Side dressing
190. May not be sawing straight
191. Pressure is wrongly applied to the lumber
192. The wood may be wet, green, or pitchy
193. The wood may be too soft for the set of the saw
194. Supported
195. Cantilever
196. Bracket
197. Suspended or hanging
198. Length of hip or valley rafters per foot of run
199. Difference in length of jacks 16 inches on center
200. Difference in length of jacks 24 inches on center
201. Side cut of jacks
202. Side cut of hip or valley
203. Avoid using defective material
204. Avoid making traps — boards that tip when walked on
205. Nail braces properly and securely
206. Keep scaffold clean — do not have blocks of wood or tools lying on the scaffold
207. Never throw anything to the ground until you know the way is clear.

ACHIEVEMENT TEST — BEGINNING WOODWORKING

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The objectives of this test are to test the student's understanding of the following:

1. How to lay out and square stock
2. How to adjust, use, and care for the common woodworking tools
3. To understand the composition, selection, and application of the common wood finishes
4. Types of fasteners
5. Qualities of lumber

This test is written for the level of ninth grade beginning woodwork. The items have been arranged so that all answers and computation can be indicated on the test paper. The items have also been arranged in homogeneous groups in that particular part of the test. The writer feels that this should provide for greater continuity of thought while marking the items. The time factor for this test has not been solved as yet. It is suggested that the first time the test is given, every student should be allowed to finish and then by an analysis of the time for each student, against his corresponding score, decide what is an appropriate time limit. Read through the general directions with the student and answer any questions that might arise. Although it is thought that the specific directions are self-explanatory, answer any question as to directions when they arise. It is preferable that this test be given in a room other than the shop where each student may be seated comfortably with enough room to work. Have a few extra sharpened pencils so that the individual as well as the group is not annoyed by persons moving to the pencil sharpener. Each answer has equal value in the scoring of the test.

General Directions: The (three) parts in this test have been arranged in the order of the time required to complete them. Answer each question as accurately as you can but do not spend too much time on one question. Proceed to the next one and, if you have enough time when you have completed the test, check your work and try to answer all questions. *Read carefully* the instructions and the example preceding each part of the test before beginning that part.

Part I — True-False

Directions: Listed below are a number of statements. Some are true and some are false. If the statement is true, encircle the *T* at the left of the statement. If the statement is false, encircle the *F*. The first item is answered as an example.

T(F) x. An ellipse is one half of a circle.

T F 1. If you make it a practice to always buy kiln-dried grade A lumber, it is not necessary to check stock quality each time you use it for a project.

T F 2. When measuring a board for length, keep the rule parallel to the edge.

T F 3. When holding the ripsaw in sawing position the toothed edge should intersect the board at an angle of approximately 60 deg.

T F 4. Keep your eye focused on the saw when sawing.

T F 5. In sawing to a line the first stroke should be a short, quick one.

T F 6. A needle will slide between the rows of teeth on a ripsaw if they have been set properly.

T F 7. It is permissable to clamp small pieces in the vise for sawing.

T F 8. More accurate measurements are obtained by placing the flat side of the rule against the surface of the wood when measuring.

T F 9. For greatest accuracy in measuring a long board, use the longest rule possible.

T F 10. In marking a piece to thickness with the marking guage, be sure to keep the head of the marking gauge flat against the face edge.

T F 11. Keep the spur of the marking gauge vertical to the surface being marked.

T F 12. There will be less danger of splitting when planing across the corners of end grain if you use a block plane.

T F 13. In marking a board to length, two lines should be drawn; one across the face side and one across the face edge.

T F 14. In cutting hardwoods it helps many times to use two hands on the saw.

T F 15. The zigzag rule is used in measuring long lengths where slight variations in measurement are not important.

T F 16. You can divide a board ½ by 2 by 5 in. into three pieces with a rule by placing zero and 4½ at the edges and draw marks at 1½ and 3.

T F 17. The setting of the marking gauge is determined by the distance from the head to the spur.

T F 18. The placement of a scale on the beam of the marking gauge has made accurate measurement a lot faster.

T F 19. The marking gauge is also handy for marking lines parallel to the end of a piece, such as marking tenons to length.

T F 20. If the lever cap of your plane will not press down, loosen the cap-iron screw slightly.

T F 21. When cutting cross-grained wood, set the cap iron closer to the cutting edge than its normal position.

T F 22. Place the plane iron in the throat with the bevel down.

T F 23. The block plane has no lateral adjustment.

T F 24. Sometimes it is only necessary to plane one side of a board true.

T F 25. The order of the six steps for squaring stock are not interchangeable.

T F 26. In planing a surface or edge press down on the handle at the beginning of the stroke and on the knob at the end of the stroke.

T F 27. In squaring up stock be sure to plane the ends true with both edges of the board.

T F 28. Do not begin sawing with the teeth of the backsaw flat on the board.

T F 29. The set of the teeth of the backsaw should be wide to allow smooth movement on small pieces.

T F 30. The heavy steel back on the back-

saw makes it rugged and good for rough work.

T F 31. In grinding a plane iron, you may be sure of having the desired 25–30 deg. bevel by making it equal to 2–2½ times the thickness of the blade.

T F 32. The same procedure is used for sharpening both plane irons and chisels.

T F 33. Remove nicks from the plane iron with the burnishing iron.

T F 34. Do not leave the wire edge on a chisel after whetting.

T F 35. Slant the dividers in the direction you draw the line when you mark a circle.

T F 36. When chamfering all edges of a board, chamfer the surfaced edges first and then the ends.

T F 37. Always use a marking gauge for laying out chamfers and bevels because of the required accuracy.

T F 38. If the blueprint calls for a ¾-in. hole, select size No. 12 when using an auger bit.

T F 39. A No. 12 twist drill bit is larger than a No. 6 drill.

T F 40. The casing nail is a good one for laying flooring.

T F 41. Common nails should be *set*.

T F 42. A screw driver should not be sharpened to a sharp point.

T F 43. The gauge of a screw is measured by the pitch of the threads.

T F 44. Gouges may be purchased with the bevel either on the inside or outside of the curve.

T F 45. Because of its curved shape the gouge is very handy for cutting mortises.

T F 46. The compass saw is another name for coping saw.

T F 47. A spokeshave is whetted in the same way a plane iron is ground.

T F 48. If the board has been surfaced smooth with the planer, the scraper will quickly remove the mill marks.

T F 49. In smoothing a board it is permissable and sometimes advantageous to pull the hand scraper toward you.

T F 50. After folding the sheet of sandpaper in fourths, cut it with the tin snips.

T F 51. If you were to examine the abrasives used on the belt sanders in several shops, you would probably find garnet used more times than flint or quartz.

T F 52. To make sure the entire surface of the wood has been smoothed, sand both across and with the grain.

T F 53. Dado joints are cut both with and across the grain.

T F 54. Vegetable glue is very good for assembling furniture because of its unusual strength when applied to wood joints.

T F 55. Dowel joints are usually nailed for strength.

T F 56. Bar clamps will open further than handscrews.

T F 57. If you wanted a wood floor in a room and were taking particular measures against warping, you would preferably use quarter-sawed flooring.

T F 58. In staining wood allow the stain to flow freely on the surface.

T F 59. Spirit stains are made by mixing dyes with alcohol.

T F 60. After filler has thoroughly hardened sand lightly with 4/0 sandpaper.

T F 61. When filling close-grained woods with shellac be sure to work the shellac into the grain by thorough brushing.

T F 62. Brush lacquer in the same manner as you would enamel.

T F 63. Between coats of varnish, sand the surface with 2/0 sandpaper.

T F 64. Quarter-sawed lumber is cheaper than plain sawed lumber.

Part II — Multiple-Choice

Directions: Each of the incomplete statements below is followed by several words, phrases, or series of numbers. From these choose the one which, when added to the incomplete statement, gives a true statement. Place the letter of that word or phrase (*A, B, C, D,* or *E*) in the parentheses at the left of the item. The first item is answered as an example.

(*D*) Veneer is bought by the (*a*) linear foot, (*b*) board foot, (*c*) by the piece, (*d*) square foot.

( ) 65. Most of the common rules used in woodworking are made of (*a*) fir, (*b*) pine, (*c*) cedar, (*d*) oak, (*e*) boxwood.

( ) 66. The most desirable plane for squaring end grain is the (*a*) jack plane, (*b*) block plane, (*c*) smooth plane, (*d*) jointer plane.

( ) 67. A panel saw is another name for a (*a*) cross-cut saw, (*b*) backsaw, (*c*) turning saw, (*d*) coping saw.

( ) 68. When squaring stock, cut to width immediately after (*a*) cutting to length, (*b*) planing the face end, (*c*) planing to thickness, (*d*) planing the face edge.

( ) 69. The cap iron should be set back from the edge of the plane iron about (*a*) ⅛ in., (*b*) 2½ times the thickness of the plane iron, (*c*) the width of the bevel, (*d*) 1/16 in.

( ) 70. If the shaving cut by your plane is always too thick on one side (*a*) your plane iron is dull, (*b*) the cap iron is set too close to the cutting edge, (*c*) the lateral adjustment should be checked, (*d*) the Y adjustment should be checked.

( ) 71. In squaring up stock always cut to width (*a*) after cutting to length, (*b*) in the final step, (*c*) in the fourth step, (*d*) before cutting to length.

( ) 72. In cutting the cross-lap joint with the backsaw the saw kerfs should (*a*) both be opposite the waste side of the lines, (*b*) be about 1/16 in. from the line to allow for chiseling on the waste side, (*c*) split the lines, (*d*) both be just beside the lines on the waste side.

( ) 73. The ratchet adjustment on the brace (*a*) holds the bit at the proper tension, (*b*) allows a backward movement in tight places, (*c*) is very advantageous in boring to a certain depth, (*d*) adjusts the "swing" of the brace.

( ) 74. A bit with a No. 7 stamped on the shank will cut a (*a*) 7/16-in. hole, (*b*) ½-in. hole, (*c*) 7/32-in. hole, (d) ¼-in. hole.

( ) 75. Twist-drill bits are sharpened (*a*) on a grinder, (*b*) with a special file, (*c*) with a three-square file, (*d*) with a rasp.

( ) 76. Pilot holes should be drilled for brass screws (*a*) to prevent corrosion, (*b*) to set the head level with the surface of the wood, (*c*) because these screws are broken easily, (*d*) to make sure they are driven straight.

( ) 77. If you were to cut a stop chamfer on the longest edges of a piece of ¾ by 2 by 8-in. lumber, you would secure best results with a (*a*) router plane, (*b*) chisel, (*c*) block plane, (*d*) drawknife, (*e*) spokeshave.

( ) 78. To do convex trimming place the piece (*a*) in C clamps, (*b*) in the vise, (*c*) on the bench hook, (*d*) flat on the bench.

( ) 79. Gouges range in size from (*a*) ¼ to 1 in., (*b*) ⅛ to 1 in., (*c*) ¼ to 2 in., (*d*) ⅛ to 2 in.

( ) 80. The most easily adaptable gouge for varied use is the (*a*) inside-bevel gouge, (*b*) outside-bevel gouge, (*c*) combination gouge, (*d*) half-round gouge.

( ) 81. The hand scraper will cut best when inclined to the surface of the wood at an angle of (*a*) 85 deg., (*b*) 45 deg., (*c*) 60 deg., (*d*) 25 deg.

( ) 82. The turning saw should be held (*a*) with both hands with the teeth pointing away from you, (*b*) with one hand with the teeth pointing toward you, (*c*) with both hands with the teeth pointed in either direction, (*d*) with one hand with the teeth pointing away from you.

( ) 83. The spokeshave is a special type of (*a*) plane, (*b*) drawknife, (*c*) scraper, (*d*) burnisher.

( ) 84. A drawknife is (*a*) beveled on two sides, (*b*) sharpened with a single-cut file, (*c*) held with the bevel down, (*d*) very good for accurate work when sharp, (*e*) held with the bevel up.

( ) 85. The hand scraper (*a*) is a quick substitute for sanding, (*b*) is very effective on concave surfaces, (*c*) may either be pulled or pushed, (*d*) works best when pushed.

( ) 86. If you needed some 2-in. finishing nails for a project you would ask for (*a*) 5d, (*b*) 8d, (*c*) 4d, (*d*) 10d, (*e*) 6d.

( ) 87. The common commercial size sheet of sandpaper is (*a*) 8½ by 11 in., (*b*) 9 by 11 in., (*c*) 10 by 12 in., (*d*) 4 by 6 in., (*e*) 8 by 10 in.

( ) 88. Casein glue is made from (*a*) horses hoofs, (*b*) fish, (*c*) vegetable matter, (*d*) milk, (*e*) blood albumin.

( ) 89. In sanding end grain, (*a*) sand in only one direction, (*b*) sand with a circular motion, (*c*) be sure to sand in both directions, (*d*) do not use a block, (*e*) sand very lightly.

( ) 90. Steps of a good step ladder are set in the legs with (*a*) mortise and tenon joints, (*b*) cross-lap joints, (*c*) rabbet joints, (*d*) dado joints, (*e*) half lap joint.

( ) 91. In cutting tenons use the (*a*) ripsaw, (*b*) backsaw, (*c*) router plane, (*d*) jointer.

( ) 92. The dowel joint is a common substitute for the (*a*) dado joint, (*b*) rabbet joint, (*c*) cross-lap joint, (*d*) mortise-and-tenon joint.

( ) 93. Spirit stains should be applied with (*a*) a brush, (*b*) a spray gun, (*c*) rags or waste, (*d*) excelsior.

( ) 94. Thin shellac with (*a*) turpentine, (*b*) linseed oil, (*c*) alcohol, (*d*) kerosene.

( ) 95. One board foot (*a*) is equal to 2 sq. ft., (*b*) equals ½ of a sq. ft., (*c*) cannot be compared with sq. ft., (*d*) is equal to 12 sq. ft.

( ) 96. If a board is milled (*a*) it is surfaced to size on a planer, (*b*) contains no mill marks, (*c*) contains no rough places, (*d*) has been sawed in the saw mill.

Part III — Completion

Directions: In the blank space that occurs in each of the following incomplete statements write the word or words (one word for each blank) that will make the statement complete and true. The first blank is filled as an example.

X. The smaller sizes of finishing nails are called *brads*.

97. In cutting a board to length, the saw cut must be square with the face and .... of the board.

98. When laying out and cutting long pieces, place the material on .....

99. The teeth of the ripsaw are .... shaped.

100. Start a handsaw with a light .... stroke.

101. After completing the second step of squaring up stock mark the surface the ....

102. Cutting to width is the .... step in squaring stock.

103. If possible plane the end grain with a .... plane.

104. To set the T bevel at a 45-deg. angle with the framing square, place the blade of the T bevel on No. 3 on the tongue and No. .... on the blade of the square.

105. If you want to cut a ⅞-in. hole, select auger bit size .....

106. The square-shanked drill bits are used in a .....

107. Keep your eye on the .... instead of the .... when driving nails.

108. Driving the nails at an angle often adds .... to the joint.

109. Cut a concave curve with the chisel with the bevel .....

110. For best cutting results hold the hand scraper at an angle of .... to the surface being smoothed.

111. Another name for a small compass saw is a .... saw.

112. In cutting mortises with a chisel, hit the chisel solidly with a .....

113. A common substitute for the mortise-and-tenon joint is the .... joint.

114. Small ornaments can be held secure until the glue sets with .... clamps.

115. Two types of grinding stones are artificial and .....

116. The most satisfactory method for the removal of moisture from wood is by .... drying.

117. A brush that has been used to apply oil stain should be cleaned with .....

118. Filler can be purchased in both the paste and .... form.

KEY

Part I

1. F	14. F	27. F	40. T	53. T
2. T	15. T	28. T	41. F	54. F
3. T	16. T	29. F	42. T	55. F
4. F	17. T	30. F	43. F	56. T
5. F	18. F	31. T	44. T	57. T
6. F	19. F	32. T	45. F	58. F
7. T	20. F	33. F	46. F	59. T
8. F	21. T	34. T	47. T	60. T
9. T	22. T	35. T	48. F	61. F
10. F	23. T	36. T	49. T	62. F
11. F	24. T	37. F	50. F	63. T
12. F	25. T	38. T	51. T	64. F
13. T	26. F	39. F	52. F	

Part II

65. e	72. d	79. d	86. e	93. a
66. b	73. b	80. b	87. b	94. c
67. a	74. a	81. b	88. d	95. c
68. a	75. a	82. a	89. a	96. a
69. d	76. c	83. a	90. d	
70. c	77. b	84. c	91. b	
71. a	78. b	85. c	92. d	

Part III

97. edge	105. No. 14	113. dowel
98. sawhorse	106. brace	114. C
99. chisel	107. nail, hammer	115. natural
100. backward	108. strength	116. kiln
101. face edge	109. down	117. kerosene
102. fifth	110. 45 deg.	118. liquid
103. block	111. keyhole	
104. 3	112. mallet	

ORTHOGRAPHIC PROJECTION AND DIMENSIONING TEST

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Directions: Each of the following statements can be correctly completed by one of the lettered expressions. Read all the statements and underline the one you think is the correct expression. Do not guess.

Sample:

A triangle has (*a*) 3 sides and 3 angles; (*b*) 4 sides and 3 angles; (*c*) 3 sides and 4 angles.

1. A line that has been bisected is divided into (*a*) no equal parts; (*b*) three equal parts; (*c*) two equal parts.

2. To bisect an arc is to divide it into (*a*) no equal parts; (*b*) two equal parts; (*c*) three equal parts.

3. An angle that is trisected is divided into (*a*) three equal parts; (*b*) two equal parts; (*c*) no equal parts.

4. Two lines perpendicular to each other form an angle of (*a*) 60 degrees; (*b*) 90 degrees; (*c*) 120 degrees.

5. An inscribed hexagon is an (*a*) eight-sided figure drawn within a circle; (*b*) six-sided figure drawn within a circle; (*c*) five-sided figure drawn within a circle.

6. A circumscribed octagon is a (*a*) five-sided figure drawn about a circle; (*b*) six-sided figure drawn about a circle; (*c*) eight-sided figure drawn about a circle.

7. An angle is a geometrical figure consisting of two (*a*) curved lines which meet; (*b*) straight lines which meet; (*c*) straight lines and a curved line which meet.

8. The size of an angle is determined by the number of (*a*) degrees between the sides of the angle; (b) inches in the length of the sides; (*c*) inches between the sides of the angle.

9. An ellipse is an oval figure bounded by a (*a*) regular curve; (*b*) irregular curve; (*c*) spiral curve.

10. An ellipse has (*a*) no axes at right angles to each other; (*b*) two axes at right angles to each other; (*c*) four axes at right angles to each other.

11. The long axis of the ellipse is the (*a*) vertical axis; (*b*) major axis; (*c*) horizontal axis.

12. The short axis of the ellipse is the (*a*) vertical axis; (*b*) horizontal axis; (*c*) minor axis.

13. A pentagon is a polygon having (*a*) five equal sides and five equal angles; (*b*) six equal sides and six equal angles; (*c*) seven equal sides and seven equal angles.

14. A hexagon is a polygon having (*a*) six equal sides and six equal angles; (*b*) six equal sides and no equal angles; (*c*) no equal sides and six equal angles.

15. A circle is a plane figure bounded by (*a*) a single curved line called the perimeter; (*b*) a single curved line called the circumference; (*c*) a single curved line called the planimeter.

16. Orthographic projection is a method used to draw a detailed description of an object in two or more views on planes at an angle of (*a*) 120 deg. to each other; (*b*) 60 deg. to each other; (*c*) 90 deg. to each other.

17. Every technical man and mechanic must have a thorough knowledge of the principles of (*a*) cabinet projection; (*b*) orthographic projection; (*c*) isometric projection.

18. The picture planes in orthographic projection are known as the (*a*) planes of projection; (*b*) isometric planes; (*c*) planes of intersection.

19. Lines parallel to each other and perpen-

dicular to a projection plane are called (*a*) projectors; (*b*) protectors; (*c*) prospectors.

20. Parallel projectors drawn perpendicular to a plane of projection will result in (*a*) a perspective projection; (*b*) an oblique projection; (*c*) an orthographic projection.

21. There are (*a*) two principal planes of projection; (*b*) four principal planes of projection; (*c*) three principal planes of projection.

22. The three principal planes of projection are the (*a*) front, vertical, and profile planes; (*b*) vertical, horizontal, and profile planes; (*c*) top, horizontal, and profile planes.

23. The three principal planes of projection used in orthographic projection are (*a*) perpendicular to each other; (*b*) horizontal to each other; (*c*) vertical to each other.

24. The most important of the three planes of projection is the (*a*) horizontal plane; (*b*) vertical plane; (*c*) profile plane.

25. Draftsmen in this country use the (*a*) first angle of projection; (*b*) second angle of projection; (*c*) third angle of projection.

26. In the third angle of projection the top view is directly above the (*a*) right-side view; (*b*) left-side view; (*c*) front view.

27. In the third angle of projection the front view is directly (*a*) below the top view; (*b*) to the right of the top view; (*c*) to the left of the top view.

28. In the third angle of projection the right side view is directly (*a*) in line with the top view; (*b*) opposite the front view; (*c*) in line with the horizontal view.

29. In the third angle of projection the left side view is placed directly (*a*) above the front view; (*b*) to the left of the front view; (*c*) to the left of the top view.

30. The number of views required to completely describe an object depends a great deal on (*a*) how the object is to be drawn; (*b*) the size of the object; (*c*) the shape of the object.

31. According to the A.S.A. arrangement of views a rectangular object may have as many as (*a*) seven ordinary views; (*b*) six ordinary views; (*c*) five ordinary views.

32. The face which best describes the characteristic shape of an object is chosen as the (*a*) front view; (*b*) top view; (*c*) right-side view.

33. The three views most frequently used to accurately describe an object are the (*a*) front, top, and right-side views; (*b*) front, top, and left-side views; (*c*) front, left-side, and right-side views.

34. A draftsman selects views having the least number of (*a*) straight lines; (*b*) dotted lines; (*c*) curved lines.

35. The left side view is always projected on the (*a*) vertical plane; (*b*) left vertical plane; (*c*) horizontal plane.

36. The front view is always projected on the (*a*) horizontal plane; (*b*) left vertical plane; (*c*) vertical plane.

37. The top view is always projected on the (*a*) horizontal plane; (*b*) profile plane; (*c*) vertical plane.

38. The right side view is always projected on the (*a*) right profile plane; (*b*) left vertical plane; (*c*) vertical plane.

39. The two over-all dimensions in the front view of an object are (*a*) length and width; (*b*) length and height; (*c*) height and width.

40. The two over-all dimensions in the top view of an object are (*a*) height and width; (*b*) length and height; (*c*) length and width.

41. The two over-all dimensions in the right-side view of an object are (*a*) length and width; (*b*) height and width; (*c*) length and height.

42. The over-all length of the object is identical in both (*a*) front and top views; (*b*) front and left-side views; (*c*) top and right-side views.

43. The over-all width of an object is identical in both (*a*) top and right-side views; (*b*) top and front views; (*c*) front and right-side views.

44. The over-all height of an object is identical in both (*a*) top and right-side views; (*b*) top and front views; (*c*) front and right-side views.

45. The first view usually to be selected for a drawing is the (*a*) top view; (*b*) right-side view; (*c*) front view.

46. A view drawn on the horizontal plane describes the shape and size of the (*a*) front surface of the object; (*b*) top surface of the object; (*c*) right-side surface of the object.

47. A view drawn on the vertical plane describes the shape and size of the (*a*) front surface of the object; (*b*) top surface of the object; (*c*) right side of the object.

48. A view drawn on the profile plane describes the shape and side of the (*a*) top surface of the object; (*b*) side surface of the object; (*c*) front surface of the object.

49. A line perpendicular to a plane of projection is seen as a (*a*) line; (*b*) surface; (*c*) point.

50. A line parallel to a plane of projection is seen (*a*) as a foreshortened line; (*b*) as a point; (*c*) in its true length.

51. When a line is at an oblique angle to a plane of projection, it is seen (*a*) as a foreshortened line; (*b*) in its true length; (*c*) as a point.

52. When a surface is perpendicular to a plane of projection, it is seen as a (*a*) true surface; (*b*) line; (*c*) as a foreshortened surface.

53. When a surface is parallel to a plane of projection, it is seen (*a*) as a foreshortened surface; (*b*) in its true shape; (*c*) as a line.

54. When a surface is at an oblique angle to a plane of projection, it is seen as a (*a*) true shape; (*b*) line; (*c*) foreshortened surface.

55. When a circular surface is perpendicular to a plane of projection, it is seen as (*a*) an ellipse; (*b*) a line; (*c*) a true circle.

56. When a circular surface is parallel to a plane of projection it is seen as (*a*) a true circle; (*b*) a line; (*c*) an ellipse.

57. When a circular surface is at an oblique angle to a plane of projection, it is seen as (*a*) an ellipse; (*b*) a true circle; (*c*) a line.

58. A mechanical drawing always gives (*a*) a poor description of the object; (*b*) a very accurate description of the object; (*c*) an average description of the object.

59. A mechanical drawing which accurately and completely describes an object in every detail is a (*a*) isometric drawing; (*b*) working drawing; (*c*) perspective drawing.

60. A detail working drawing consists of the necessary (*a*) dimensions, titles, and notes; (*b*) views, titles, and notes; (*c*) dimensions, views, and notes.

61. A working drawing is used in (*a*) every branch of industry; (*b*) only the metal trades; (*c*) only the building trades.

62. Working drawings used in the shop are usually in the form of (*a*) blueprints; (*b*) ozalid prints; (*c*) Van Dyke prints.

63. The shape of an object is described by the (*a*) dimensions; (*b*) views; (*c*) notes.

64. The size of an object is described by the (*a*) notes; (*b*) views; (*c*) dimensions.

65. The notes which give information about the object not obtained in any other way must be (*a*) brief, clear, complete, and inaccurate; (*b*) brief, clear, accurate, and complete; (*c*) poorly lettered, incomplete, and lengthy.

66. Hidden lines are (*a*) medium weight dotted lines; (*b*) lightweight dotted lines; (*c*) heavyweight dotted lines.

67. Hidden lines are used to describe (*a*) invisible edges and surfaces of the object; (*b*) invisible edges and visible surfaces of the object; (c) visible edges and invisible surfaces of the object.

68. Hidden object lines are composed of dashes (*a*) 1/16 in. in length and spaced ⅛ in. apart; (*b*) ⅛ in. in length and spaced ⅛ in. apart; (*c*) ⅛ in. in length and spaced 1/16 in. apart.

69. The first dash of a hidden line (*a*) never touches the line from which it starts; (*b*) sometimes touches the line from which it starts; (*c*) always touches the line from which it starts.

70. When a full line crosses another full line and continues as a hidden line (*a*) no space is left between the full line and the first dash of the hidden line; (*b*) a space is left between the full line and the first dash of the hidden line; (*c*) a space is sometimes left between the full line and the first dash of the hidden line.

71. Mechanical drawings are dimensioned for the purpose of describing the (*a*) size of the object; (*b*) shape of the object; (*c*) making of the object.

72. A working drawing must be completely dimensioned (*a*) to assist in checking the drawing; (*b*) to describe the correct sizes of the part; (*c*) to give the drawing a finished appearance.

73. A dimension line is a fine, full line drawn (*a*) perpendicular to the distance to be measured; (*b*) at an angle to the distance to be measured; (*c*) parallel to the distance to be measured.

74. The dimensions are generally placed (*a*) below the dimension line; (*b*) above the dimension line; (*c*) in line with the dimension line.

75. A leader is used to direct attention to a (*a*) hole shown by a note in the top view; (*b*) point, line, or surface to which the note or dimension refers; (*c*) point in the front view.

76. A leader is made (*a*) with T square and triangle; (*b*) freehand; (*c*) with an irregular curve.

77. A note on the drawing for a counterbored hole should give the (*a*) diameter and depth of the hole; (*b*) diameter and length of the hole; (*c*) diameter and angle of the hole.

78. A note for a countersunk hole should give the (*a*) diameter and depth of the hole; (*b*) diameter and length of the hole; (*c*) diameter and angle of the hole.

79. All dimensions up to and including 72 inches are expressed in (*a*) feet and inches; (*b*) inches; (*c*) feet and fractions of a foot.

80. All dimensions greater than 72 in. are expressed in (*a*) inches; (*b*) feet and fractions of a foot; (*c*) feet and inches.

81. Extension lines are fine, full lines starting about (*a*) ¼ in. from the object; (*b*) ⅛ in. from the object; (*c*) 1/16 in. from the object.

82. Extension lines are to extend about (*a*) 1/16 in. beyond the dimension line; (*b*) ⅛ in. beyond the dimension line; (*c*) ¼ in. beyond the dimension line.

83. The size of a circle is always given as a (*a*) radius; (*b*) diameter; (*c*) chord.

84. The dimension figure giving the diameter of a circle should always be followed by the symbol (*a*) dia.; (*b*) D.; (*c*) diam.

85. Horizontal dimension on a drawing should read from (*a*) left to right; (*b*) right to left; (*c*) top to bottom.

86. Vertical dimensions on a drawing should read from (*a*) bottom to top; (*b*) top to bottom; (*c*) right to left.

87. Inclined dimension on a drawing should read from (*a*) left to right; (*b*) top to bottom; (*c*) bottom to top.

88. An angle is dimensioned by placing the dimension figure (*a*) inclined on an arc used as a dimension line; (*b*) vertically on an arc used as a dimension line; (*c*) horizontally on an arc used as a dimension line.

89. The bar separating the two parts of a fraction is drawn (*a*) perpendicular to the dimension line; (*b*) inclined to the dimension line; (*c*) parallel with the dimension line.

90. Parallel dimensions are to be at least (*a*) ⅛ in. from the object and ¼ in. from each other; (*b*) ¼ in. from the object and ⅛ in. from each other; (*c*) ¼ in. from the object and ¼ in. from each other.

91. In a three-view drawing the dimensions should be placed (*a*) between the views of the object; (*b*) on the views of the object; (*c*) anywhere on the drawing.

92. In a two-view drawing the dimensions are placed (*a*) anywhere on the drawing; (*b*) to the right of the views; (*c*) to the left of the views.

93. The over-all dimensions should (*a*) never be given; (*b*) sometimes be given; (*c*) always be given.

94. The dimensions for a solid cylinder are placed on the (*a*) two views; (*b*) rectangular view; (*c*) circular view.

95. As an aid to clarity a dimension should (*a*) not be repeated; (*b*) be repeated; (*c*) left off entirely.

96. Dimension figures on an average drawing should be (*a*) ¼ in. high; (*b*) 3/16 in. high; (*c*) ⅛ in. high.

97. The fractions for dimension figures on an average drawing should be (*a*) two times the height of the whole number; (*b*) one and two-third times the height of the whole number; (*c*) one and one-fourth times the height of the whole number.

98. A chamfered edge is a (*a*) beveled edge; (*b*) rounded edge; (*c*) filleted corner.

99. An object that measures 2 in. on all sides is (*a*) spherical in shape; (*b*) cubical in shape; (*c*) rectangular in shape.

100. A solid that is 2 in. in diameter is (*a*) cubical in shape; (*b*) cylindrical in shape; (*c*) spherical in shape.

ANSWER FOR MULTIPLE-RESPONSE TEST

1. *c*	21. *c*	41. *b*	61. *a*	81. *c*
2. *b*	22. *b*	42. *a*	62. *a*	82. *b*
3. *a*	23. *a*	43. *a*	63. *b*	83. *b*
4. *b*	24. *b*	44. *c*	64. *c*	84. *b*
5. *b*	25. *c*	45. *c*	65. *b*	85. *a*
6. *c*	26. *c*	46. *b*	66. *a*	86. *a*
7. *b*	27. *a*	47. *a*	67. *a*	87. *a*
8. *a*	28. *b*	48. *b*	68. *c*	88. *c*
9. *a*	29. *b*	49. *c*	69. *c*	89. *c*
10. *b*	30. *c*	50. *c*	70. *b*	90. *c*
11. *b*	31. *b*	51. *a*	71. *a*	91. *a*
12. *c*	32. *a*	52. *b*	72. *b*	92. *b*
13. *a*	33. *a*	53. *b*	73. *c*	93. *c*
14. *a*	34. *b*	54. *c*	74. *c*	94. *b*
15. *b*	35. *b*	55. *b*	75. *b*	95. *a*
16. *c*	36. *c*	56. *a*	76. *a*	96. *c*
17. *b*	37. *a*	57. *a*	77. *a*	97. *b*
18. *a*	38. *a*	58. *b*	78. *c*	98. *a*
19. *a*	39. *b*	59. *b*	79. *b*	99. *b*
20. *c*	40. *c*	60. *c*	80. *c*	100. *c*

ELECTRICAL TEST

CLAYTON E. BUELL

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Ohm's Law, Series and Parallel Circuits

Directions: Answers for test items 1 to 17 will be found in the list following item 17. Select the right answer from this list and place its letter in the space left for it in the given test item.

Example. If the answer to item No. 2 is *resistance,* place its letter *Q* in the space left for it in item 2.

1. Electrical pressure is measured in ( ).

2. Opposition to an electric current is called ( ).

3. If this opposition is extremely great, the substance is called an ( ).

4. If electricity can be forced through a conductor only with difficulty, the conductor has a ( ).

5. The three best conductors of electricity, in use, are ( ), ( ), and ( ).

6. The unit of electrical current is called the ( ).

7. Electric current is measured with a meter called a ( ).

8. In order to force current through any circuit, a high ( ) is necessary.

9. When ( ) goes through a lamp, the lamp lights.

10. Electrical pressure is measured by a meter called a ( ).

11. Electrical friction is called ( ). The unit is called the ( ).

12. The unit of electromotive force is called the ( ).

13. All resistances give off ( ) when carrying a current.

14. Voltage drives ( ) through a circuit.

15. An ampere is a ( ) per ( ).

16. A big advantage of the parallel circuit for general purposes is that the ( ) remains unchanged when loads are added.

17. When Ohm's Law is applied to the whole circuit, the voltage, resistance, and current must be for the ( ) circuit; when it is applied to a part of the circuit, the voltage, resistance, and current must be for the given ( ) of the circuit.

ANSWERS

A. Aluminum	N. Ohm
B. Ammeter	O. Parallel
C. Ampere	P. Part
D. Brass	Q. Resistance
E. Copper	R. Second
F. Coulomb	S. Series
G. Current	T. Silver
H. Friction	U. Steel
I. Gallon	V. Volt
J. Heat	W. Voltage
K. High resistance	X. Voltmeter
L. Insulator or insulation	Y. Water
M. Iron	Z. The whole

Directions for questions 18 and 19. There are three possible answers as given in the table following test question 19. Select the correct answer and place its letter in the proper spaces.

18. Three important facts concerning the series circuit are: the total current is equal to ( ); the total resistance is equal to ( ); the total voltage is equal to ( ).

19. Three important facts concerning the parallel circuit are: the total current is equal to ( ); the total resistance is equal to ( ); the total voltage is equal to ( ).

ANSWERS

A. Sum of the part
B. Same as that of the parts
C. Less than any part

Directions for questions 20 to 24. Cross off the word that is not wanted to answer the question correctly.

20. It takes a (large; small) wire to carry a large current.

21. A voltmeter has a (high; low) resistance. A (large; small) current flows through it.

22. High resistance allows a (large; small) current to flow. A high voltage forces a (large; small) current through the circuit.

23. In a parallel circuit the current becomes (more; less) as the load is increased; and the resistance becomes (more; less).

24. An ammeter has a very (high; low) resistance.

Directions for questions 25 to 30. Fill in

the answers to the following questions. Draw diagrams and make calculations where necessary. Use the back of the test sheet for calculations.

25. Ohm's Law formula may be written in three ways; they are

I = ( ); E = ( ); R = ( ).

26. One hundred volts can force ( ) amperes through 5 ohms' resistance.

27. If a 27.5 ohm lamp is used on a 110-volt line, ( ) amperes will flow through the lamp.

28. Three resistances are connected in series across 230 volts. Resistor *A* is 25 ohms, *B* is 15 ohms, and *C* is 20 ohms. How much current will flow? What is the voltage across *A*? What is the voltage across *B*? What is the voltage across *C*?

29. Find the total resistance of three resistances connected in parallel. The resistances are respectively 2 ohms, 5 ohms, and 12 ohms.

30. Three resistances *A*, *B*, and *C* are connected in parallel across 120 volts. The resistance of *A* is 15 ohms, and the resistance of *C* is 20 ohms. The current through *B* is 8 amperes. What is the resistance of *B*? What is the total resistance? What is the total current flow?

KEY

1. V
2. Q
3. L
4. K
5. E, A, and I
6. C
7. B
8. W
9. G
10. X
11. Q, N
12. V
13. U
14. G
15. F, R
16. W
17. Z, P
18. B, A, A
19. A, C, B
20. Large
21. High; small
22. Small; large
23. More; less
24. Low
25. E/R; IR; E/I
26. 20 amp.
27. 4 amp.
28. 3.83 amp.; 95.75 volts; 57.45 volts; 76.6 volts
29. 1.28 ohms
30. 15 ohms; 5.45 ohms; 22 amp.

Problems and Projects

INDIVIDUAL ATHLETIC TROPHIES

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All elementary and junior high schools having competitive athletics can put new spirit and pep into the athletic competition by awarding individual trophies to the members of the championship team.

School shops can easily make attractive and coveted trophies and at the same time vitalize the shop classes with the design, materials, tools, jigs, and processes used in the creation of the trophies.

The bracelet shown at *A* in Figure 1 has been designed as a football trophy but a baseball, basketball, or volleyball could be substituted for the football and thus the bracelet idea could be used as a trophy for these other sports as well. It is suggested that the aluminum sheet be cut into 1-in. strips on a squaring shear. Schools not having such shears may have the shearing done at any furnace or tin shop.

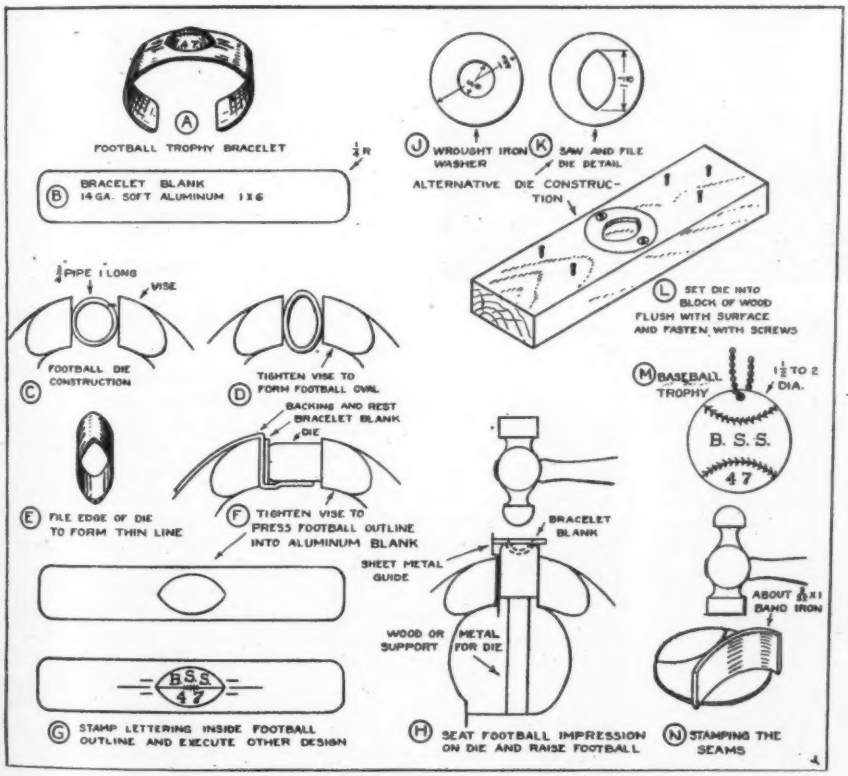
FOOTBALL TROPHY BRACELET
BRACELET BLANK 14 GA. SOFT ALUMINUM 1 X 6
WROUGHT IRON WASHER
SAW AND FILE DIE DETAIL
ALTERNATIVE DIE CONSTRUCTION
SET DIE INTO BLOCK OF WOOD FLUSH WITH SURFACE AND FASTEN WITH SCREWS
PIPE 1 LONG
VISE
FOOTBALL DIE CONSTRUCTION
TIGHTEN VISE TO FORM FOOTBALL OVAL
BASEBALL TROPHY
1½ TO 2 DIA.
BACKING AND REST
BRACELET BLANK
DIE
FILE EDGE OF DIE TO FORM THIN LINE
TIGHTEN VISE TO PRESS FOOTBALL OUTLINE INTO ALUMINUM BLANK
BRACELET BLANK
SHEET METAL GUIDE
WOOD OR METAL SUPPORT
METAL FOR DIE
ABOUT 3/8 X 1 BAND IRON
STAMP LETTERING INSIDE FOOTBALL OUTLINE AND EXECUTE OTHER DESIGN
SEAT FOOTBALL IMPRESSION ON DIE AND RAISE FOOTBALL
STAMPING THE SEAMS

Fig. 1. Individual athletic trophies

To prepare a die for the football impression on the bracelet proceed as follows: cut a piece of ¾-in. pipe, 1 in. long. File the ends square. Place the pipe in a vise as shown at *C* in Figure 1, and tighten vise to form football oval as shown at *D*. File the edge on one end of the pipe to form a more pointed oval at the ends as shown at E and thin the edge all around by filing. Check the edge to be sure it is in the same plane. Polish the filed edge with emery cloth. Prepare the backing and rest as shown at *F*. Use any available sheet metal for this purpose.

To use the die, merely place a bracelet blank on the rest, center the die in relation to the bracelet blank and apply pressure with the vise to impress the football design into the aluminum. The blank should have the corners and edges rounded and polished with emery cloth before the impression is made. After the impression has been made, put in all lettering and design work. The lacing and seam may be put in with a chasing tool made from a 16*d*. nail. Cut off about an inch from the pointed end of the nail and file the remaining end to a chisel edge similar to that of a cold chisel. File the bevels on the nail about 3/16 in. long and have the actual edge quite blunt or dull. Polish the edge with emery cloth. Rest the aluminum on a heavy metal object having a smooth surface when executing the lettering or any design. Steel lettering punches may be used for the lettering or one of the vibrating tools recently introduced can be used instead. Next place the die in a vise as shown at *H*, Figure 1, and carefully seat the football impression in the bracelet onto the die and raise the football with a ball-peen hammer. Next polish the aluminum with No. 4/0 steel wool, soap, and water. Then shape the bracelet over a round rod or preferably over an elliptical wood or metal form.

An alternative die construction is shown at *J*, *K*, and *L*. To use this die it is merely neces-

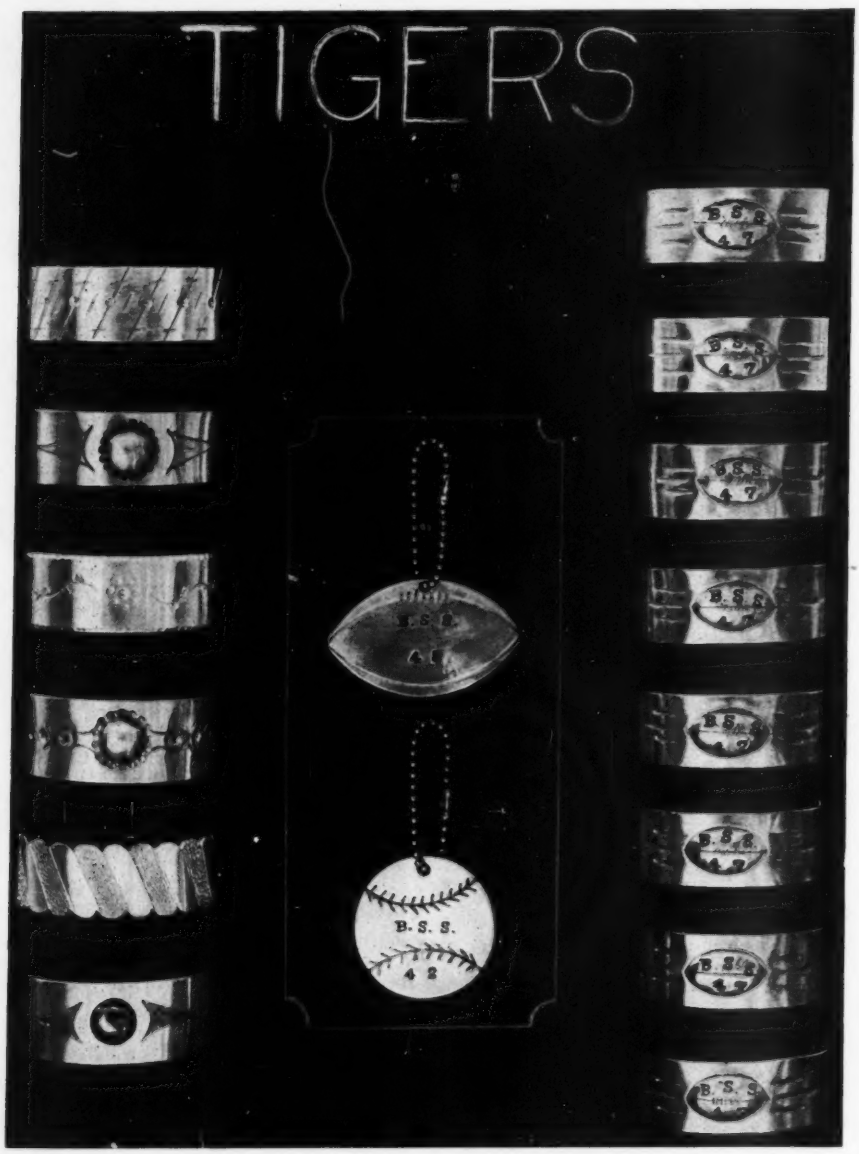

Fig. 2. Samples of bracelets and key-ring tags made of aluminum by students in the author's classes. These articles make excellent athletic trophies

sary to place the aluminum blank between the nails and raise the football with a ball-peen hammer. Any lettering or other design should of course be carefully located and executed before the raising process. To make bracelets for baseball, basketball, or volley-ball trophies merely raise the aluminum into the end of a piece of ¾-in. pipe or into the round hole of a washer. Where space will not permit lettering directly on the ball, the lettering may be arranged on the bracelet outside of it.

At *M* is shown a baseball trophy designed to be suspended from a key chain. Most boys wear this type trophy suspended from their belt strap. Small footballs, basketballs, etc., executed like the baseball shown at *M*, are eagerly desired by the youngsters. At *N* is shown a method of stamping the seams on a ball. Another method of outlining the seams would be to follow a template with a chasing tool improvised from a 16*d*. nail if no other tool is available. The stitches may be executed with a stamping tool improvised from a nail. Rest the aluminum on a heavy metal object having a smooth surface when doing any stamping or chasing.

The display of the finished trophies a couple of weeks in advance of the awarding will create much interest, particularly if they are displayed on a dark background or cloth or paper.

A STORE-AWNING PROBLEM IN MECHANICAL DRAWING

E. CARL STOCK

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The meat store awning, shown in the accompanying drawings, is a problem which will provide the mechanical drawing teacher with an interesting lesson.

It is suggested that the objectives of the problem be reviewed first. These are drawing to scale, drawing an auxiliary view, a knowledge of *foreshortening*, calculation of areas and a knowledge of decimal equivalents of fractions of a foot.

By making the drawing to the scale of ½ in. equals one foot, the teacher has the opportunity to compare this scale with the scale of 6 inches equals one foot, or half size. This objective requires skillful handling by the pupils and teacher whose equipment does not include a scale, but only an ordinary 12-inch ruler.

As will be observed, no dimensions are given directly on the auxiliary view. This compels the pupils to obtain the measurements from the view showing the end of the awning and from the view showing the street front. From the information given in these views, the pupils draw the auxiliary view, thus completing the three-view drawing.

The next objective stresses foreshortening of objects and is illustrated by the word *meats*. It is suggested the teacher furnish the location of the lettering guide lines on the auxiliary view and then center the A. Follow by lettering the M and the S, placing the E and T in position last. This procedure usually provides well-spaced letters. The teacher should now show how to project the guide lines to the end view and from there to the front view. By allowing the pupils to measure the height of the letters on the front of the awning and to compare it with the height as shown in the auxiliary view, foreshortening will be demonstrated clearly. The teacher should now show the pupils how to mark off the widths of the letters as drawn in the auxiliary view on a long strip of paper. This paper is then placed on the front view and the letter widths trans-

DECIMAL EQUIVALENTS OF INCHES IN TERMS OF FEET

INCHES	0	1/4	1/2	3/4
0	0	.0208	.0417	.0625
1	.0833	.1042	.1250	.1458
2	.1667	.1875	.2083	.2292
3	.2500	.2708	.2917	.3125
4	.3333	.3542	.3750	.3958
5	.4167	.4375	.4583	.4792
6	.5000	.5208	.5417	.5625
7	.5833	.6042	.6250	.6458
8	.6667	.6875	.7083	.7292
9	.7500	.7708	.7917	.8125
10	.8333	.8542	.8750	.8958
11	.9167	.9375	.9583	.9792

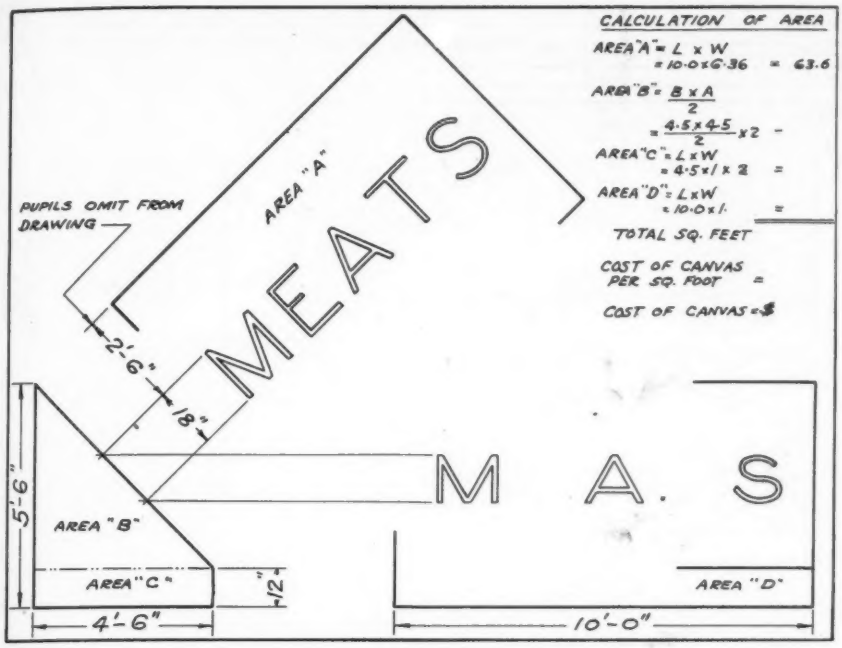

Fig. 1. Awning layout and calculations

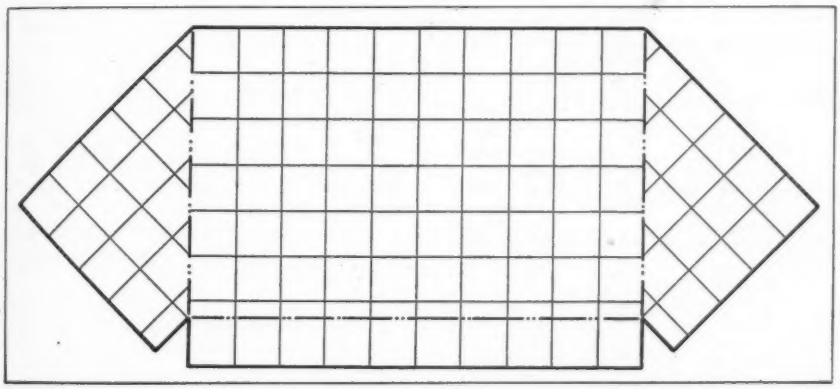

Fig. 2. Development of awning material needed for seams not shown

ferred there. Now carefully letter the word *meats*, using the widths as transferred and keeping the style of letter as shown in the auxiliary view. When this objective is completed, the pupils should have a clear example of foreshortening before them — one which shows how the height of the letter apparently decreases when viewed at an angle.

The teacher should explain how to calculate the area of simple shapes. Most school systems include such calculations in the mathematics courses, and perhaps only a "fresher" lesson will be required. The objective is to calculate the number of square feet (or square yards if the teacher so desires) of canvas required to make the awning. One way is to reduce all measurements to inches, but it is suggested instead that the teacher compose a table giving the decimal equivalents of the fractions of a foot. Such a table permits the pupils to place the given dimensions in decimal form and by multiplying the length of an area by its width, the square footage is obtained with no further arithmetic being needed. This decimal method, incidentally, serves when calculating weights of castings, capacities of tanks, and similar drafting duties.

The teacher should now lead the pupils in a discussion about the surfaces of the awning, arriving at the conclusion that it has a rectangular top surface, a rectangular front surface and two end surfaces composed of triangular and rectangular areas.

Now show how to arrange the calculations in the upper right area of the paper, keeping in mind to letter only the given figures and the answer. This means the pupils should omit all arithmetical computations. The total area should then be multiplied by the cost per square foot (or square yard) of canvas as sold in your community to arrive at the cost of the awning.

The teacher may wish to extend this problem by having the pupils draw a pattern or development of the awning and then draw co-ordinate lines one foot apart (watch the scale!) on the development. By counting the number of squares, a close check on the calculations may be obtained and this device has the advantage of making area calculations clearer to the pupils.

A DEMONSTRATION T SQUARE

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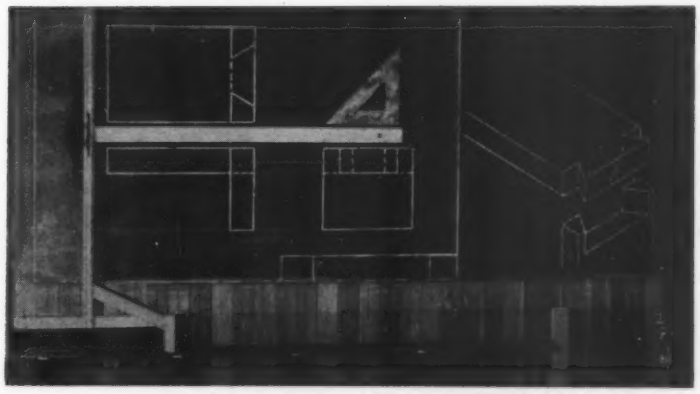
The illustrations shown herewith present a very good teaching device for beginning drawing classes.

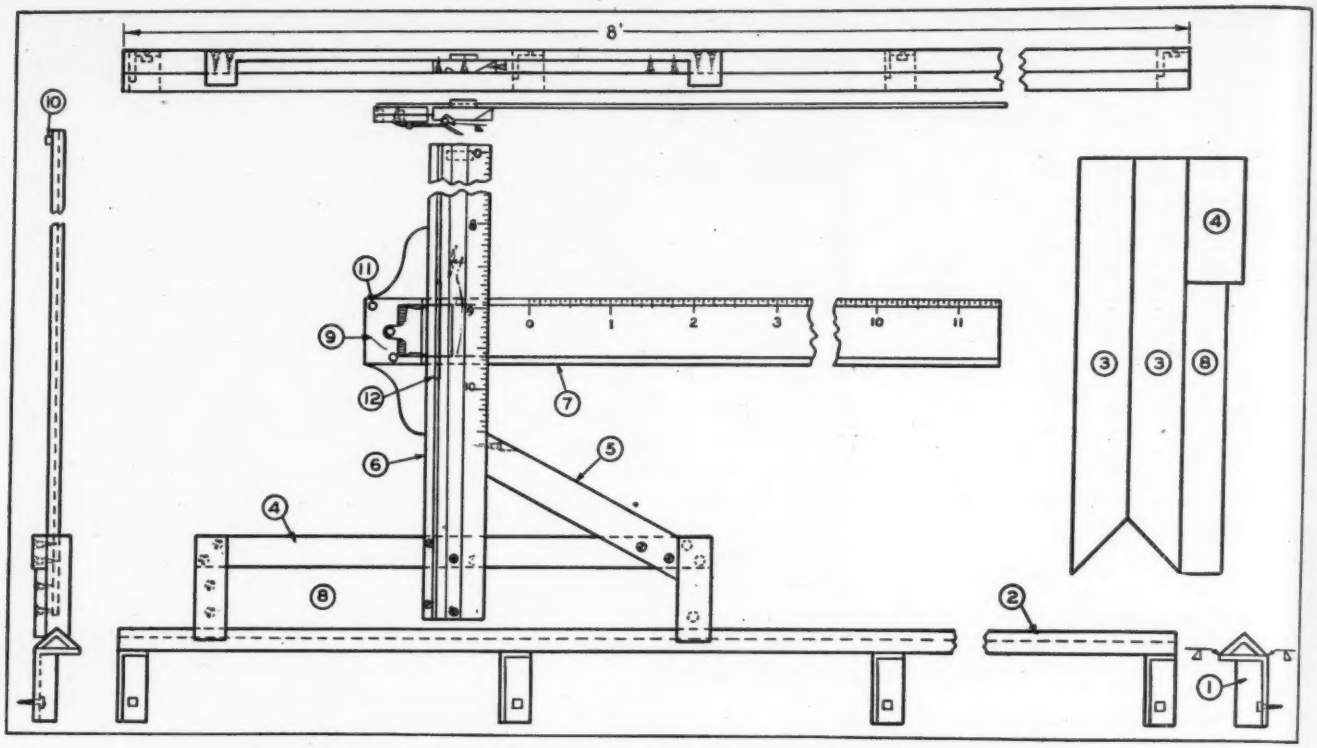
This device enables the teacher to demonstrate the correct use of the T square, triangles, and pencil, and the correct way to lay out a drawing to avoid cumulative errors and the quickest and easiest way to produce the third of the three orthographic views. All this with the very tools the learner uses.

Part 8, the stabilizer, is the part which makes this device practical. The weight holds the device to the track and at the same time holds the T square against the blackboard, and makes it possible to slide the T square up with the left hand and yet the entire device can be instantly lifted off and put in a cupboard for safe keeping.

Holes in part 1, and in the track support,



Demonstration T square



Teaching device for beginning drawing classes — a demonstration T square

BILL OF MATERIAL

No. of part	*No. of pieces*	*Size*	*Material*	*Name*
1	6	3/16 x 1¼ x 1¼ x 5½	Angle iron	Track support
2	1	3/16 x 1¼ x 1¼ x 96	Angle iron	Track
3	4	11/16 x 1 9/16 x 5	Hardwood	Track shoes
4	1	⅝ x 2 x 25	Hardwood	Track-shoe head
5	1	⅝ x 2 x 13¼	Hardwood	Upright brace
6	1	11/16 x 3 x length required	Hardwood	Upright
7	1	48 in.		T square
8	1	½ x 3½ x 25	Hot rolled steel	Stabilizer
9	1			Rattrap
10	1	⅛ x ½ x 2	Wood	Spacer
11	2	5/16 x 1½		Dowels
12	1	⅜ x 6	Drill rod	Shoe

should be rather large to provide leveling of T square after complete device is in place. Pasteboard shims may be required behind part 1 to compensate for humps in the blackboard.

With 8-ft. track, 4-ft. T square, and 2-ft. track shoe head (part 4), the device will cover 11 ft. of board.

Upright, part 6, should be beveled on right edge to zero thickness so that scale marks will be close to board. The scale should be such as to be in the same proportion as the student's board and paper. We use a net drawing space of 10½ in., and the upright scale in a ratio of 4 to 1 so that the figures and graduations are the same as the learner uses and the drawing fills the board.

Friction to hold the T square in place is obtained by the pressure of a rattrap on part 12 which rides against a 60-deg. incline sawed in the front of upright, part 6. Part 12 should be silver soldered to rattrap.

Parts 3, 4, and 5 and 6 should be glued and screwed. The chalk tray must be removed from the board where upright, part 6, travels. The board is held to the wall by No. 12 by 1½-in. f.h. wood screws. If the board is slate, drill holes with a twist drill. Slate drills easier than hardwood but will burn a drill if an electric drill is used. Countersinking the holes in the slate for the flathead screws must be properly done. In this case the countersunk hole must be at such an angle that the largest diameter of the head only touches the slate. If the bottom of the screwhead touches the slate, it will cause the slate to crack. Three screws per 6-ft. section are sufficient at the bottom to support the weight and one screw at the top to hold the board to the wall.

A stop should be placed at each end of the track to prevent the T square from running off.

The track needs to be well sandpapered after which it should be lubricated with a cake of paraffin. The bottom of the track shoes also should be lubricated with paraffin.

The T square blade should be marked in the same scale used on the upright.

The cost of the materials for this device is very small. Most of the materials are in stock in secondary school shops. The metal cutting, bending, drilling, and welding can be done with little equipment or skill. The 60-deg. surface can be produced in the upright, part 6, by tilting the circular saw dado and the bevel on the right edge can be done in the same way.

Care should be used in assembly to make the top edge of part 4 parallel to the track and the left edge of part 6 at 90 deg. to part 4.

TOY GUN

C. H. McCLINTOCK
State Teachers College
Bemidji, Minn.

Learning Units

You will learn the following new units in doing this job:

1. How to use a gouge
2. How to bore holes with auger bits
3. How to bore holes with twist drill bits
4. How to cut a pierced design
5. How to use a spokeshave

Tool List

1. Try square
2. Bench rule
3. Dividers, with pencil clip
4. Backsaw
5. Coping saw
6. Compass saw
7. Jack plane

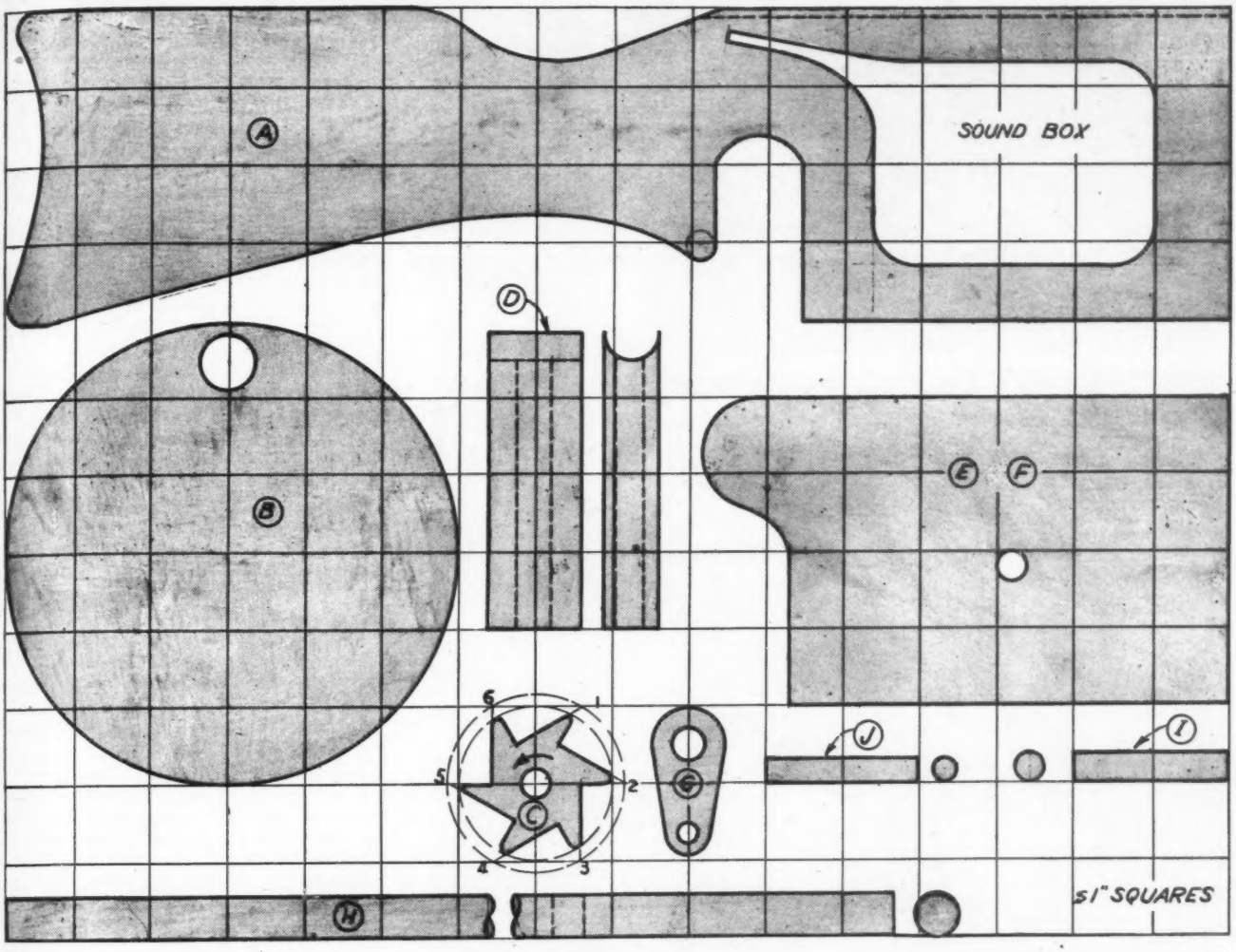


Fig. 1. Details of toy gun

8. Spokeshave
9. ¾-in. gouge
10. Half round cabinet file
11. Round wood file
12. Bit brace
13. Nos. 4, 6, and 12 auger bits
14. No. 7 bit-stock twist drill bit
15. Hand drill
16. Nos. 52, 54, and 60 wire gauge twist drill bits
17. Claw hammer
18. Screw driver, 4-in.
19. Blueprint

Stock List

Part number	*Name of part*	*Kind of material*	*Rough size*
A	Stock	Softwood	1 by 4 by 16½
B	Magazine	Softwood	1 by 6½ by 6½
C	Click wheel	Hardwood	⅝ by 2¼ by 2¼
D	Fore grip	Softwood	1 by 1½ by 5
E and F	Sound box covers	¼-in. plywood	¼ by 4 by 7
G	Crank	Hardwood	½ by 1¼ by 2½
H	Barrel	Birch dowel	⅝ to 1 diam. by 18
I	Crankshaft	Birch dowel	⅜ diam., cut to fit
J	Crank handle	Birch dowel	¼ diam. by 2
K	Spline	Birch	1/16 to ⅛ by ⅝ by 4
L	Dowel	Birch	⅜ in. diam. by 5 in.

1 — 2½-in. No. 10 r.h. blued wood screw
2 — 1½-in. No. 10 r.h. blued wood screw
4 — ½-in. No. 8 r.h. blued wood screw
2 — *6d* finishing nails
8 — ¾-in. No. 17 wire brads
Glue
Finishing materials

Procedure

Refer to Figure 1

Stock: 1 by 1 by 16½ in.

1. Square to ¾ by 3⅞ by 16 in.
2. Lay out in 1-in. squares.
3. Draw the outline of the stock. Part A in the drawing.
4. Bore a ¼-in. saw-starting hole in the sound box portion of the stock.
5. Saw to within 1/16 in. of the outline.
6. Work to the outline with the cabinet and round files.
7. Saw out the pierced portion of the stock.
8. Gouge a groove in the top of the forward portion of the stock, as indicated by the dotted line in the drawing. This gouged groove should fit the curvature of the barrel.

Magazine: 1 by 6½ by 6½ in.

1. Plane the two faces.
2. Locate the center of the piece.

FIG. 2

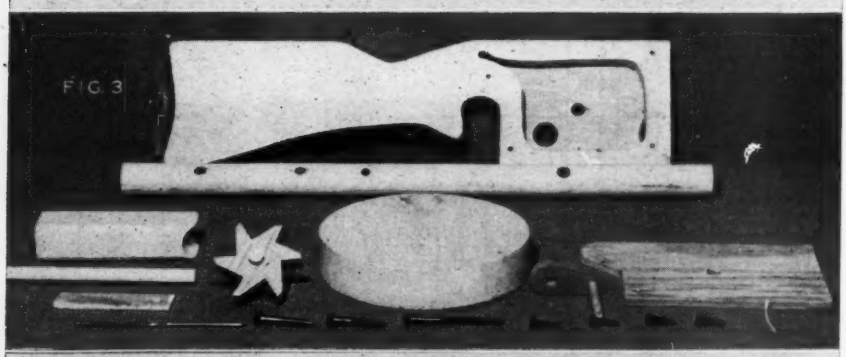


FIG. 3

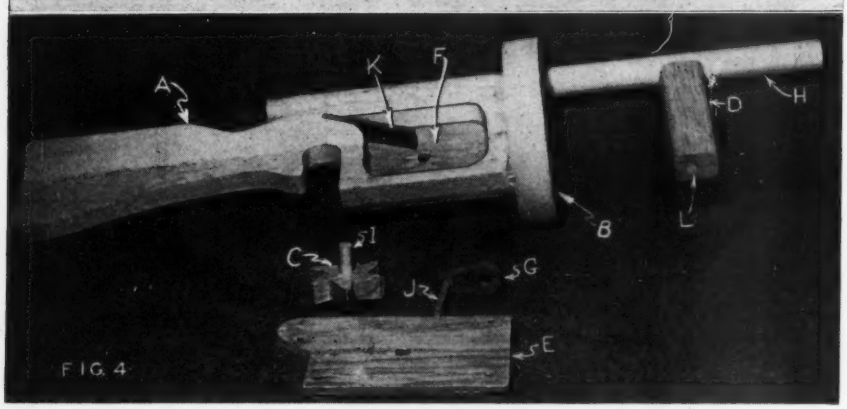


FIG. 4

The toy gun

3. Scribe a 6-in. circle on one face.
4. Saw out the disk.
5. Work to the line with spokeshave and file.
6. Lay off a line through the center of the disk. This line is to be used in locating the hole for the barrel, and the two nail holes.
7. Lay off the center of the hole for the barrel ½ in. from the edge of the disk. (This measurement is for a ¾-in. barrel. If a different size barrel is used, the edge of the hole should be ⅛ in. from the edge of the disk.)
8. Bore the ¾-in. hole.
9. Bore the holes for the 6*d*. finishing nails, 1½ and 3 in., respectively, from the edge of the disk.

Click wheel: ⅝ by 2¼ by 2¼ in. hardwood

The teeth of the click wheel are inscribed in a 2¼-in. circle:

The completed wheel is 2 in. in diameter.

The direction of rotation is indicated by the arrow in the drawing.

(It is suggested that the instructor make a sheet-metal template for this part.)

1. Divide the 2¼-in. circle into 6 equal parts.
2. Number the points 1 through 6
3. To obtain the teeth having the form shown in the drawing, use the following schedule:

A. Connect point 1 with points 4 and 5.
B. Connect point 2 with points 5 and 6.
C. Connect point 3 with points 6 and 1.
D. Connect point 4 with points 1 and 2.
E. Connect point 5 with points 2 and 3.
F. Connect point 6 with points 3 and 4.

4. Draw a 2-in. concentric circle.
5. Round off the teeth on this second circle.
6. Bore a ⅜-in. hole through the center of the piece.
7. Saw to the outlines of the teeth.
8. Use a cabinet file to round off the teeth.

Fore grip: 1 by 1½ by 5-in. softwood

1. Square to ¾ by 1¼ by 4¾ in.
2. Locate the center of each end.
3. Bore a ⅜-in. hole lengthwise through the center of the piece.
4. At one end, bore a ¾-in. hole through the width of the piece. This must be done carefully to avoid splitting the piece.

Sound box covers: 2 pcs. of ¼ by 4 by 6-in. plywood

1. Fasten the two pieces together with ½-in. No. 18 wire brads.
2. Plane the edges of the two pieces to 3⅞ in. in width.
3. Lay out as shown in the drawing.
4. Locate the hole for the click-wheel shaft; bore a ⅜-in. hole through both pieces.
5. Saw to the outline.
6. Work to the outline with the cabinet file.
7. Separate the pieces.

Crank: ½ by 1¼ by 2½-in. hardwood.

1. Square to ⅜ by 1 by 2 in.
2. At one end, draw a semicircle 1 in. in diameter.
3. At the other end, draw a semicircle ½ in. in diameter.
4. Draw straight lines tangent to the two semicircles.
5. Locate the holes for the shaft and the handle.
6. Bore a ⅜-in. hole for the shaft, and a ¼-in. hole for the handle.
7. Saw out the piece.
8. Work to the outline with a cabinet file.

Barrel: ¾-in. dowel, 18 in. long. As indicated in the bill of materials, the barrel may be any dowel stock from ⅝ to 1 in. in diameter. If dowels larger than ¾-in. are used, the magazine and fore grip should be made from 1¼-in. stock.

1. Locate the centers of the ends of the barrel.
2. Draw a center line lengthwise of the barrel.
3. Starting at the breach end of the barrel, lay off on the center line the following measurements: 2, 3, and 2½ in. These measurements locate the holes for the screws used in fastening the barrel to the stock.
4. Use a No. 7 bit-stock twist drill bit to bore the holes.
5. The distance from the muzzle to the fore grip is left for the student to determine. Bore a ⅜-in. hole though the barrel at the desired place. Use care in aligning this hole with the screw holes at the breach end.
6. The diameter of the holes in the ends of the barrel is a matter for the student to decide. They should be bored to a depth of about 3 in.

Crankshaft and crank handle, respectively

1. Cut a piece of ⅜-in. birch dowel 2 in. long for the shaft.
2. Cut a piece of ¼-in. birch dowel 2 in. long for the handle.

Spline: 1/16 to ⅛ by ¾ in. by 3½-in. birch

The thickness of the spline is dependent upon the age of the boy who is to own the toy. Younger boys are unable to turn the

crank when the spline is more than 1/16 in. in thickness. The length of the spline varies (1) with the size of the finished click wheel, and (2) with the placement of the wheel within the sound box.

1. Obtain a piece of birch of the proper thickness ¾ in. wide and 4 in. long from your instructor.
2. Plane to ⅝ in. wide.
3. Bore a ¼-in. hole in the center and ½ in. in from the end of the piece.
4. The spline must fit loosely in its slot in the stock.
5. The spline is cut to length during the assembly of the toy.

Assembly: Refer to Figures 2, 3, and 4.

1. Sand all pieces before assembling.
2. Glue and brad the left sound-box cover in place. After the cover has been glued and nailed in place, the noise-escape hole may be cut. This hole may be bored through the left sound-box cover, or a ¾-in. piece may be cut from the lower part of the sound-box frame.
3. Glue and nail the magazine to the front end of the stock, being careful to line up the bottom of the hole for the barrel with the groove in the top of the stock.
4. The fore grip is fastened to the barrel with a 5-in. length of ⅜-in. dowel, and glue. Cut the dowel off flush with the barrel and the fore grip.
5. Fasten the barrel to the stock with glue, and r.h. blued wood screws. The 2½-in. screw is used at the breech end. The spline should be cut to length and put in place at this time. The 2½-in. screw holds the spline in place.
6. The click wheel and crankshaft are now assembled. The wheel is glued and nailed to shaft.
7. The click wheel and shaft, and the crank and its handle are assembled on the right sound-box cover.
8. Fasten the right sound-box cover, with its assembly, in place with four ½-in. No. 8 r.h. blued wood screws.

Finishing

1. Use walnut oil stain on the stock, sound box, and crank.
2. After the stain has dried, give the entire toy two coats of thin shellac. Rub down each coat of shellac with No. 2/0 steel wool.
3. Finish the barrel and fore grip with black enamel.
4. Finish the magazine with red enamel.

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ART METALWORK

ARTHUR C. WENZEL
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State Teachers College
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The art-metal shop class, at California State Teachers College, is conducted on a unit shop plan as a part of the general metalwork program.

All of the shopwork is done under the direct supervision of the instructor. Shop tested projects are constructed. Each project is demonstrated by the instructor so that the student might observe the performance of basic operations and techniques. The student is urged to show personal expression of ability and design in all of his work. The photograph shows a small sampling of the projects in this fundamental course.

The students learn to work with copper, aluminum, nickel silver, sterling silver, brass, stainless steel, and pewter. They learn basic operations and techniques in piercing, chasing, repoussé, raising, forming, etching, planishing, silver soldering, polishing, die work with soft aluminum, etc.

Art-metalwork exhibit

Reading left to right, front row: Solley and Leffler. Center row: Tueche, Reyburn, Brammer, Shuma, Skelly, Dewey, Teslovich, and A. J. Hoover, acting director of industrial arts. Back row: Nayler, Seaton, Hawkins, Seaman, Placchi, and A. C. Wenzel, instructor.

SUET FEEDER

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Pittsburgh, Pa.

The accompanying illustrations show an original design of a cylindrical shaped suet cage, which is used by the author in his cabin in the woods.

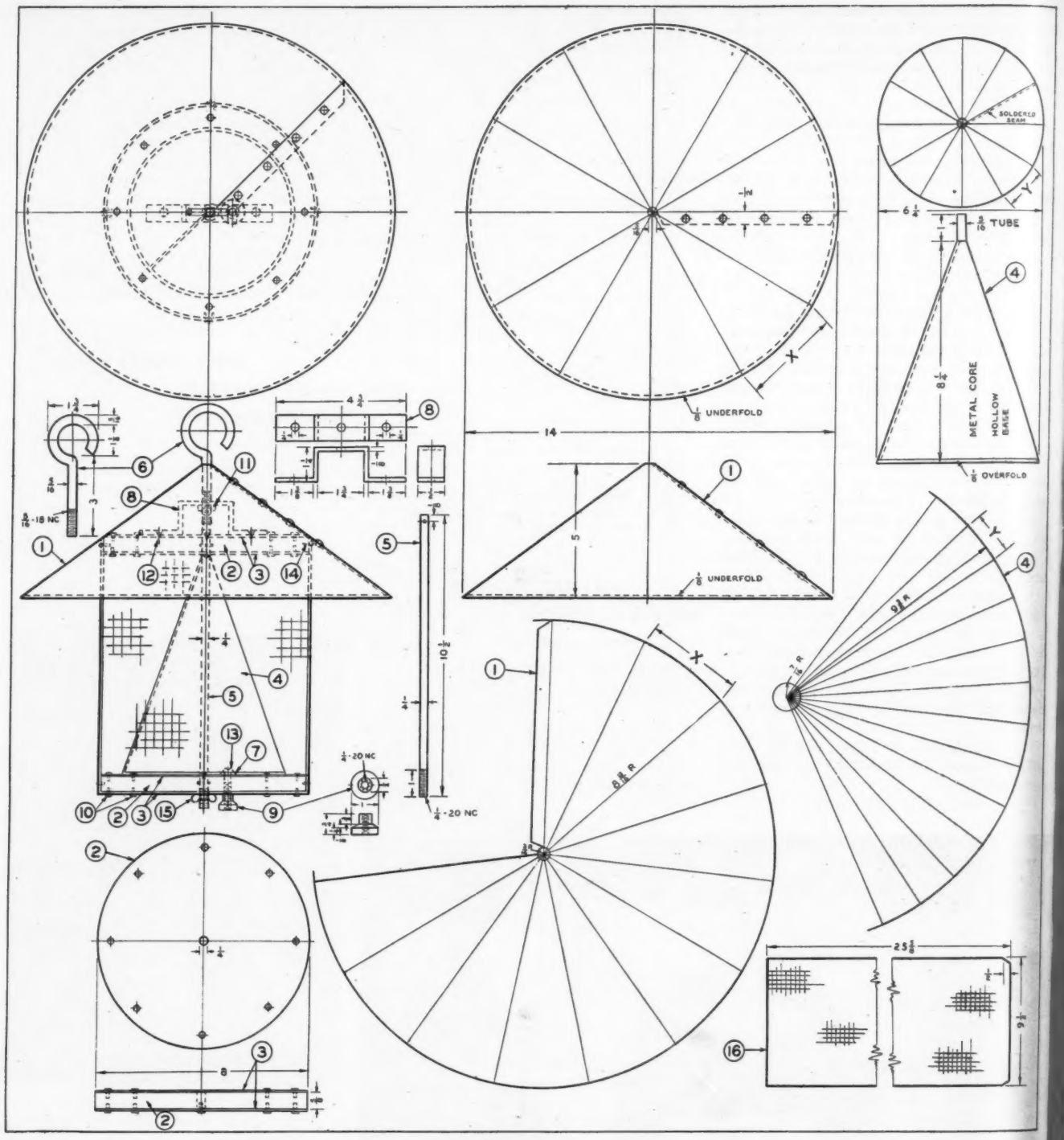
The main advantages of the design are its uniqueness, capacity, and the protection it affords against raids by crows, rats, and other pests.

Suet feeder

The bottom block comes out for filling with suet, or better still, by tacking the staples in the top block or plinth only, the roof can be removed, and new suet (preferably ground suet) packed in from the top.

The feeder will hold about eight pounds of suet. If the suet is ground, the cone effect in the center acts as a hopper.

All the parts can be made in the school shops. The shape and design and size of the hanging chain or wire is optional.



Suet cage

Our cage hangs from the 2 by 4-in. rafters in the cornice at the center of the picture window in the living room.

A good coat of aluminum paint acts as a preservative and brightens up the cage.

Our woods birds will keep on eating the suet (especially the downy woodpecker) until it is a year old and green with mold.

BILL OF MATERIALS

Part No.	*Name*	*No. required*	*Size*	*Material*
1	Hood	1	14 3/8 x 17 3/4	Sheet metal
2	Disk	2	8 x 8	Wood
3	Disk cover	4	8 x 8	Sheet metal
4	Hopper	1	9 3/8 x 16 1/2	Sheet metal
5	Centering rod	1	1/4 x 10 1/2	
6	Hook	1	5/16 x 7 1/2	
7	Washer	2	1/4	W. 1
8	Suspension bracket	1	1/8 x 1/2 x 7	Band iron
9	Knob	1	1 x 3/4	

Part No.	*Name*	*No. required*	*Size*	*Material*
10	Tacks	32	½ in.	Wire tacks
11	Nut	1	¼ in.	
12	Screws	2	No. 9 x ¾ f.h.	
13	R.h. cap screw	1	¼ x 1	
14	Galvanized staples	12		
15	Wing nut		¼ in.	
16	Galvanized screen		⅛-in. mesh	

INDIAN SILVERSMITHING

BEN HUNT

Hales Corners, Wis.

(Continued from page 34 of the January, 1948, issue)

Rings

Plate 16 shows 25 ring designs. Some of them were sketched from rings made by southwest Indians and the others were designed and made by the author. A few of them will bear a little explanation, especially for those who are not familiar with the methods used by Indian silversmiths. In the ring shown in Figure 1 you will note that the base of the bezel is curved to fit the finger better. That calls for an inner riser in the bezel to give the stone a flat surface to rest on.

It is hard to show how Figure 2 is constructed. The long oblong base to which the bezels are soldered was laid on another larger piece of silver and the wire loops are of the same gauge (20 B & S). After soldering, the larger piece was filed or sawed away, up to the wire loops.

The ring in Figure 4 has no over-all base. The actual mount was constructed first. Then the twisted wires and the raindrops were laid together on a flat piece of charcoal or asbestos, and soldered. Any resulting unevenness can be rectified by laying the soldered ring top on a level piece of metal and tapping it flat with a piece of hardwood and a hammer.

Figures 7, 12, 13, and 19 show what can be done with odd shaped stones.

Figure 9 was made to fit a beautiful specimen of turquoise matrix which needed no other form of ornamentation. Figure 10 shows a popular Navaho style of a man's ring. The band is made of three rings of round wire, similar to the band in Figure 1.

Figure 9 is a ring made to resemble one seen in Santa Fe. It represents a Zuni sunset. The stone is half of a broken cabuchon which required a little lapidary work and is an example of how some of the oddly shaped stones get their shapes.

Figure 18 is a sun symbol. The rays are pieces of silver wire, rounded at the ends. To keep these wires from moving out of position during the soldering operation, lay them in a solution of gum tragacanth and water. This will not interfere with the flux, which is used in the regular way. Gum tragacanth can be bought at the prescription counter of almost any drugstore.

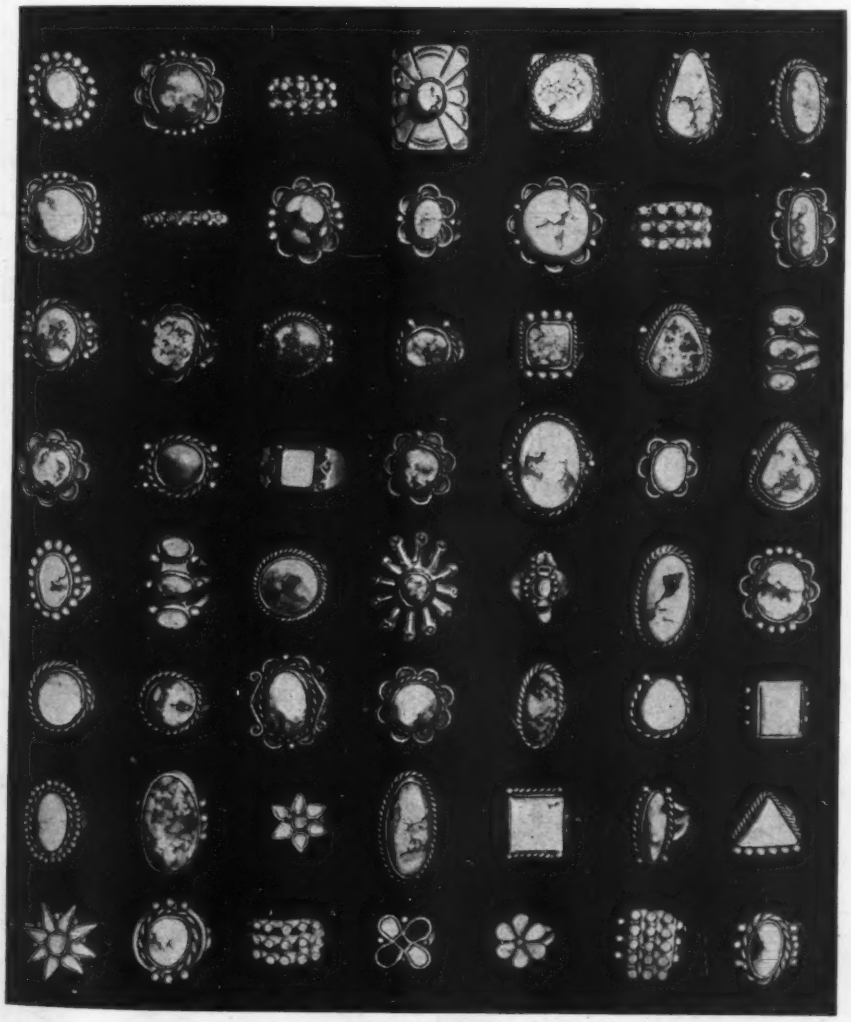
Figure 19 is a ring set with green turquoise. Instead of the regular twisted wire, the ornament was made of one strand of square wire, twisted rather tightly. The raindrops are very even in size and may have been bought ready-made.

Figure 22 shows a beautiful ring of two stones cut from the same shade of turquoise. An allover piece of silver was used for the base.

Figure 25 is a ring set with petrified wood. The bezel, twisted wire, and raindrops were soldered to the base and the base was then sawed out and filed. This gives the whole top of the ring a more substantial support.

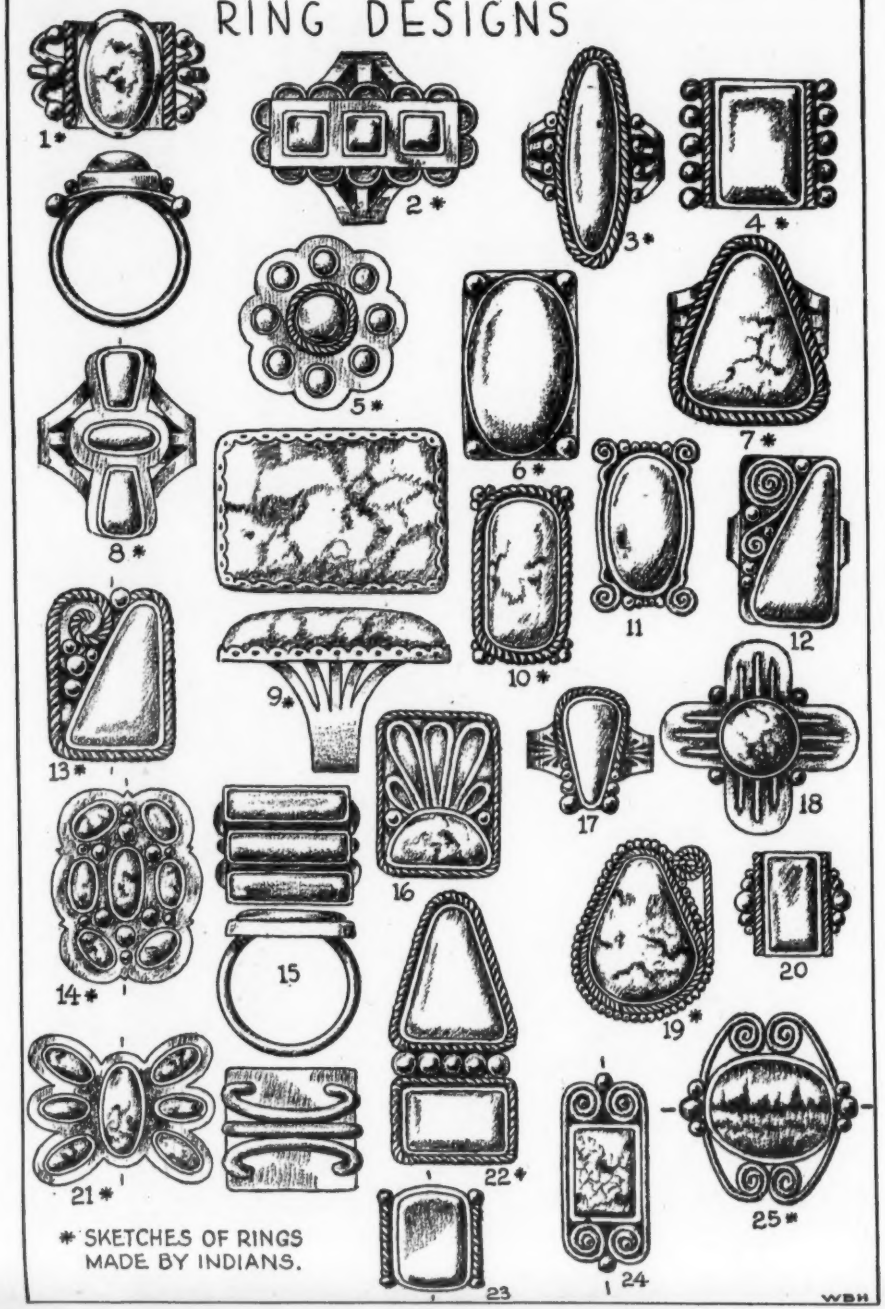
Every now and then one sees a broken stone in a large ring or bracelet. Turquoise matrix is very apt to crack when dropped or when hit by a hard object. A cracked stone is usually of no value unless it can be cut up and reground into smaller stones, or when the crack can be covered as is shown in the sketches at the top of Plate 17. This sometimes adds to the attractiveness of the mount if done with a little thought and patience. A more or less straight fracture can be hidden by a straight bar wide enough to cover the crack. It should fit flush with the stone and the bezel. That can be done by carefully filing a groove for the bar. When properly fitted, the band is soldered to the bezel at each end with 50-50 tinner's solder and a small soldering copper. Do not use a flame as it will burn and discolor the turquoise, and do not use too much solder. Excess solder can be removed with a sharp knife and since lead solder turns black in time, it won't be noticeable.

In the second broken stone, a more elaborate covering must be used, and since rattlesnakes are supposed to be quite common in the southwest, what more appropriate ornament can one wish for? As shown below the rings, the snake is hammered and filed to shape first, the body being triangular in cross section and quite low. After shaping, stamp the crosshatching of diamond shapes along



Tray of Indian made rings photographed at the Turquois Post, Santa Fe, N. Mex.

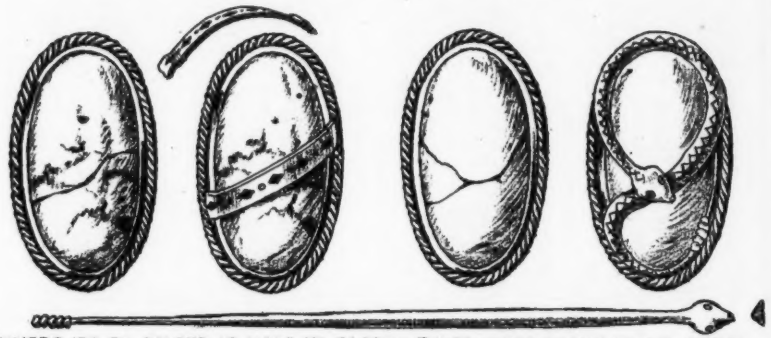
RING DESIGNS



* SKETCHES OF RINGS MADE BY INDIANS.

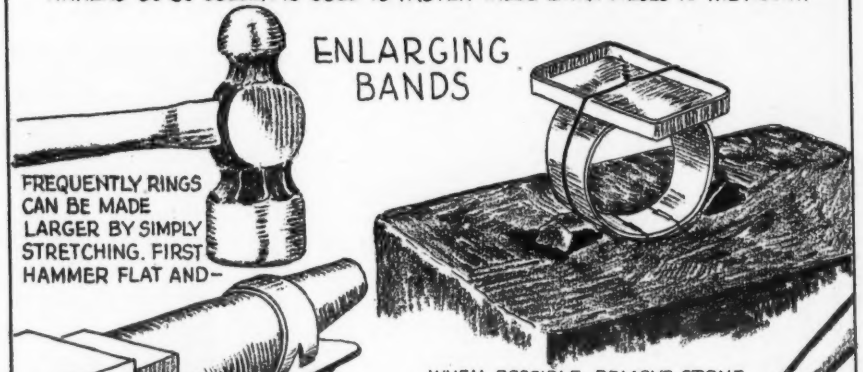
WBH

DISGUISING CRACKED STONES



TINNERS 50-50 SOLDER IS USED TO FASTEN THESE EXTRA PIECES TO THE MOUNT.

ENLARGING BANDS

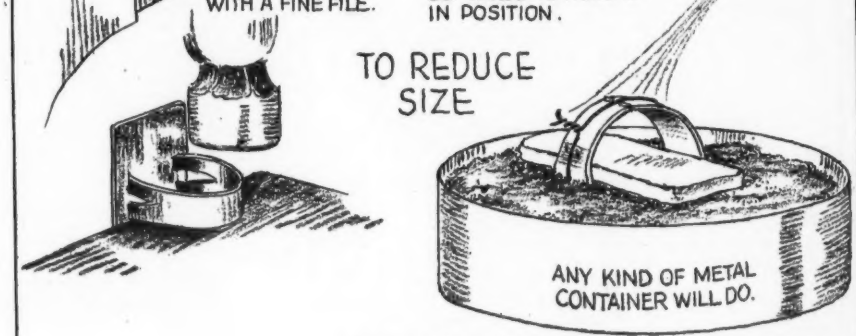


FREQUENTLY RINGS CAN BE MADE LARGER BY SIMPLY STRETCHING. FIRST HAMMER FLAT AND—

THEN HAMMER THE EDGE. FINISH WITH A FINE FILE.

WHEN POSSIBLE, REMOVE STONE BEFORE SOLDERING. A PIECE OF SILVER SET INTO THE BAND TO ENLARGE IT SHOULD BE WIRED TO HOLD IT IN POSITION.

TO REDUCE SIZE



ANY KIND OF METAL CONTAINER WILL DO.

WHEN STONE CANNOT BE REMOVED SAFELY, SET MOUNT IN WET SAND TO SOLDER.

WBH

the back. Anneal it to be certain it will bend easily and twist it to fit over the cracks, and to lay perfectly flush with the setting. It is then soldered with 50-50 tinner's solder where it touches the bezel or other silver. There is a certain satisfaction in a job of this kind as it often results in a better looking piece of jewelry than it was originally.

Below these rings in Plate 17 is shown how a ring band can be enlarged by stretching the band on the horn of an anvil or some other round piece of metal. Hammering spreads the metal in all directions. Hold it down tight to the horn. Then take it off the horn and hammer the edges to bring the width of the ring back to the proper size. Repeat if the ring has not stretched enough. File and polish for final finish.

When the difference is too great for stretching, the band is sawed through at the bottom and a piece of silver is set in as shown at center right, and wired in place. After soldering, place the ring over an anvil horn or ring mandrel and tap the joints carefully to even up any irregularities. Finish up by filing and polishing.

At the bottom of the plate is a sketch showing a ring being soldered in wet sand with the stone left in the setting. Whenever it is possible and practical, stones should be taken out of the setting before doing any soldering. This is usually done by running a sharp knife point along the edge of the stone, thereby pushing back the bezel edge. Sometimes matrix or soft stones chip at the edges when removal of the stone is attempted. In such a case, the wet sand is the answer. The ring is packed in clean wet sand and a small piece of asbestos or charcoal is placed as shown, to reflect heat back to the soldering point. The asbestos will also prevent the sand from drying out and getting too hot.

THE WINDOW FRAME AS A ROOM UNIT

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There is a continual search for inexpensive, worth-while units that may be set up in the regular classroom to give vocational experience to the children.

These units, to meet the test of school boards, principals, teachers, and pupils, must possess those elements that call for greater attention, desire to conquer an involved situation, one where success can be immediately measured, where training may even immediately be turned to financial gain and where the financial outlay to the taxpayer can be kept at a minimum.

This unit on the window frame pictured in Figure 1 costs from 10 to 15 dollars, and has at least 22 teaching units and many more, if we desire to break them up into smaller parts according to the immediate group.

Window 16 by 16 by 1⅜ — 2 lts.
Weights, 2½ lb. 4 wtd.
Sash cord, 4 wtd.

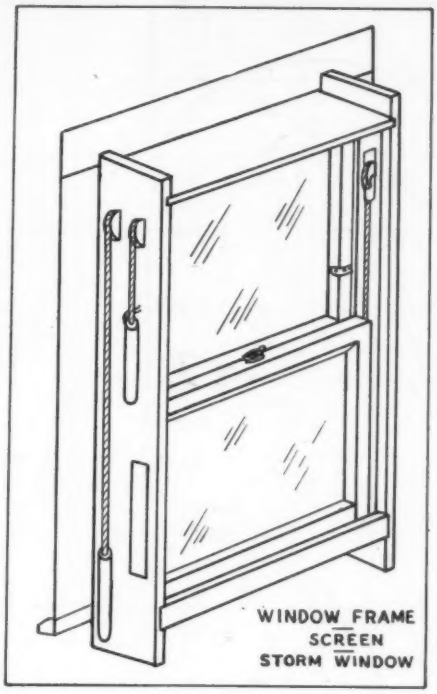

Fig. 1. Window-frame unit

Window catch, 1 wtd.
Safety lock, 1 wtd.
Screen, 1 wtd.
Storm window, 1 wtd.

Teaching Units

1. How to clean a window.
2. How windows are constructed. (Frame, sash, weights, pulleys, screen, storm window, etc.)
3. How to put on a window catch.
4. How to replace a window catch.
5. How to put on a night lock.
6. How to replace or repair a night lock.
7. Remove lower sash and replace.
8. Remove upper sash and replace.
9. Replace cord in lower sash.
10. Replace cord in upper sash.
11. Replace pulley for lower sash.
12. Replace pulley for upper sash.
13. Find weights, retie cord, lower sash.
14. Find weights, retie cord, upper sash.
15. How to make putty.
16. Replace window light.
17. Replace, repair, or make a new parting bead.
18. Hang a window shade.
19. Put on runner for window screen.
20. Put on window screen.
21. Set on hangers for storm window.
22. Hang storm window.

These units are all purposeful and appeal particularly to youngsters who have an eye on activities that may help them financially.

Bequests of iron nails, along with jewels, are found in wills of wealthy American colonists because England forbade the colonies to manufacture articles of iron.

MAKING TEMPLATES AND IRREGULAR CURVES

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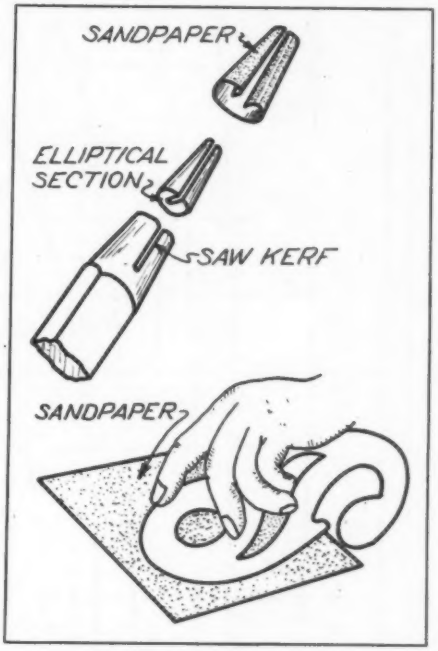
Cutting curves out of sheet celluloid for the drafting room does not involve much difficulty if an original curve can be used directly as a pattern. To do this, a good plan is to use frisket paste to stick the curve temporarily to the celluloid and scratch a



Smoothing the curves

groove around the outline with a phonograph needle mounted in an old penholder. Best results can be obtained if the first markings are made very lightly. In cutting celluloid .03 in. or more in thickness, the curve should be mounted on the back side and the cutting completed from there. Long nosed pliers may be used to break out the curves.

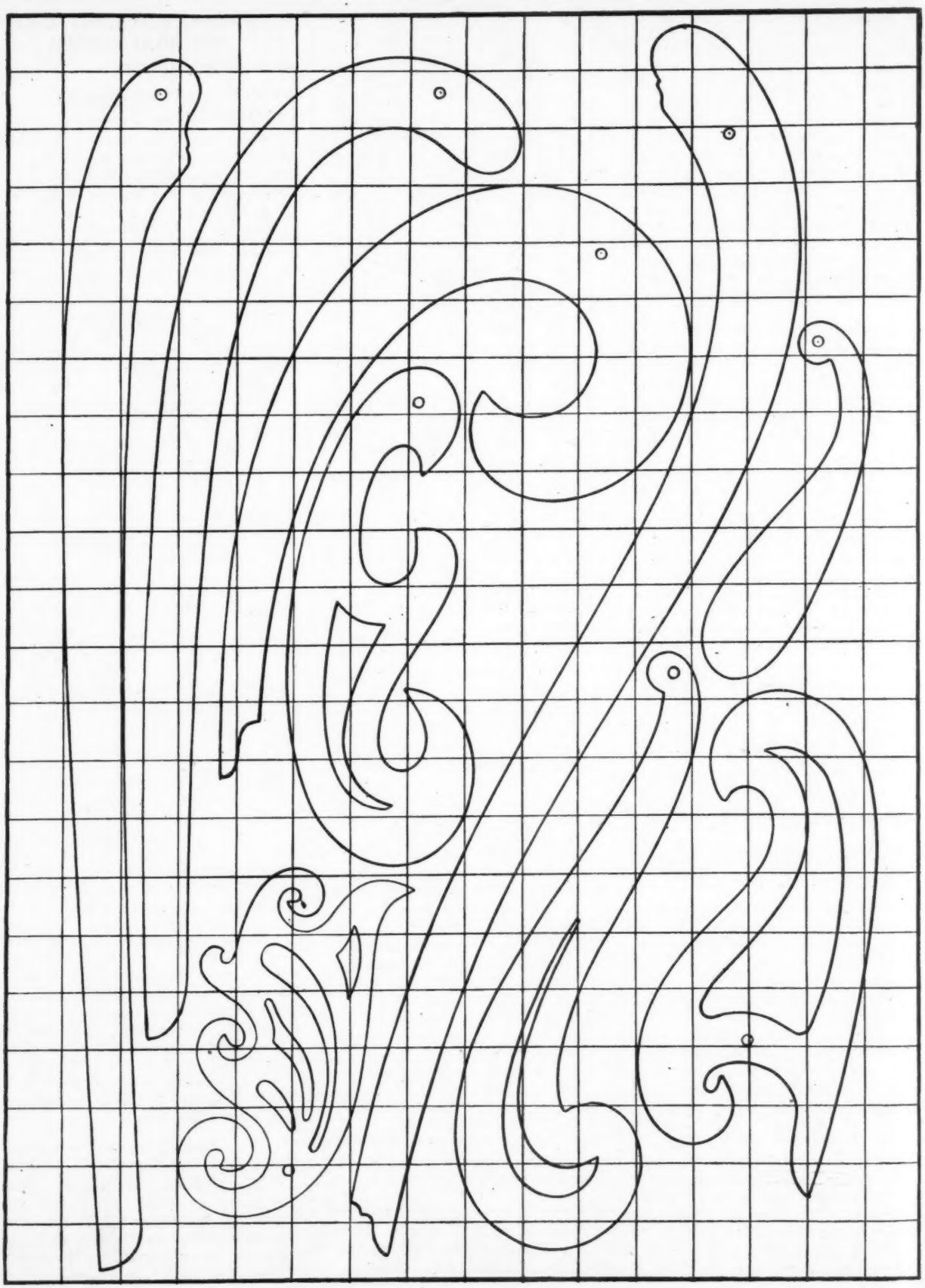
Smoothing Edges of Celluloid Curves

The edges of convex curves may be smoothed by rubbing the curve on sandpaper mounted on a flat surface. In order to get true ellipses sandpaper may be mounted on a tapered stick whose cross sections are elliptical in shape. This stick would be slit a ways down the middle so as to hold the sandpaper in place. A jeweler's rattail file and a round-flat small file may be used to advantage in smoothing out the smaller holes.

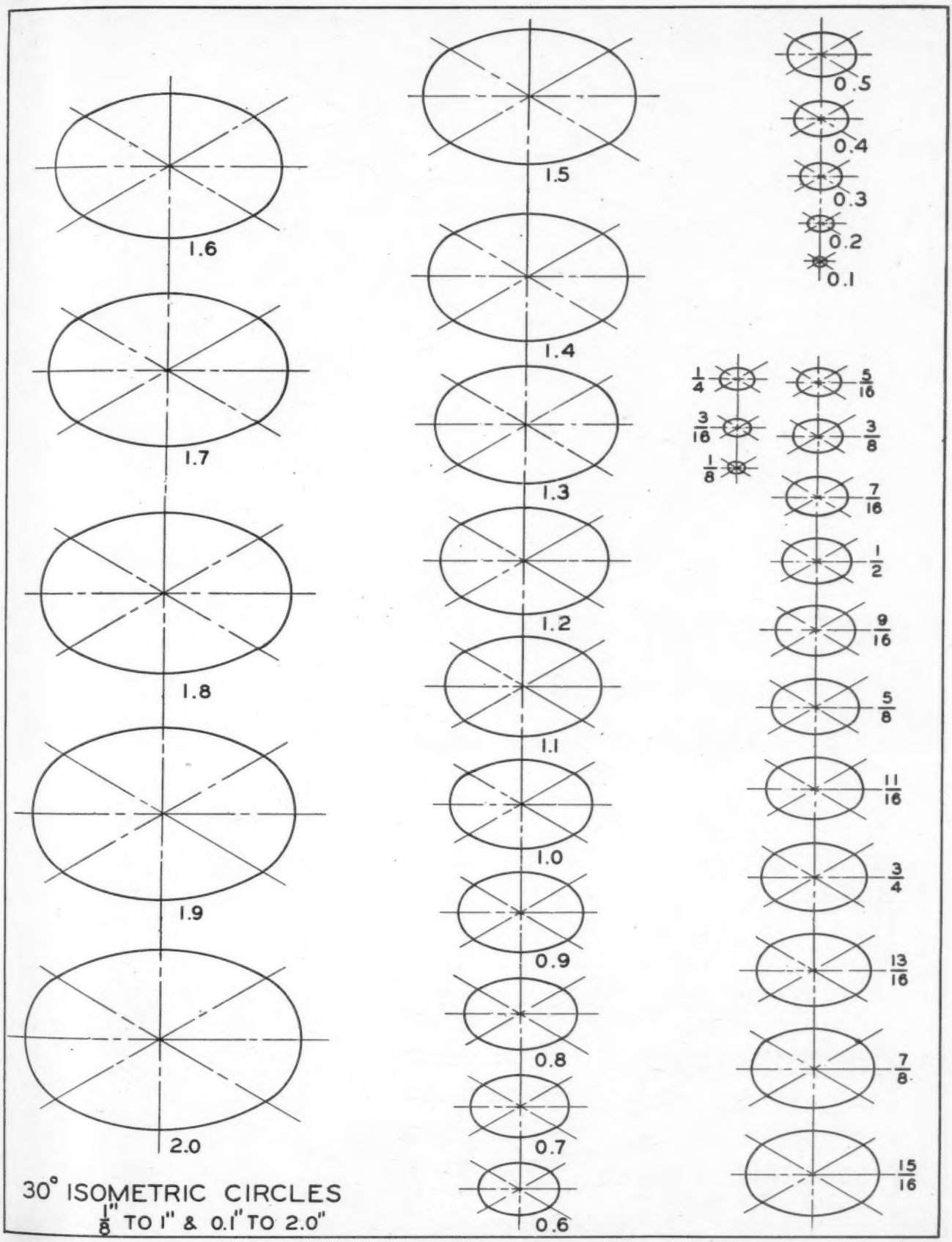
Making Special Curves

To make up a special curve the shape should be drawn carefully on paper and the curve to be cut out pasted lightly to the celluloid. With the aid of proper irregular curves at hand, a groove should be scribed carefully with the phonograph needle. This groove can

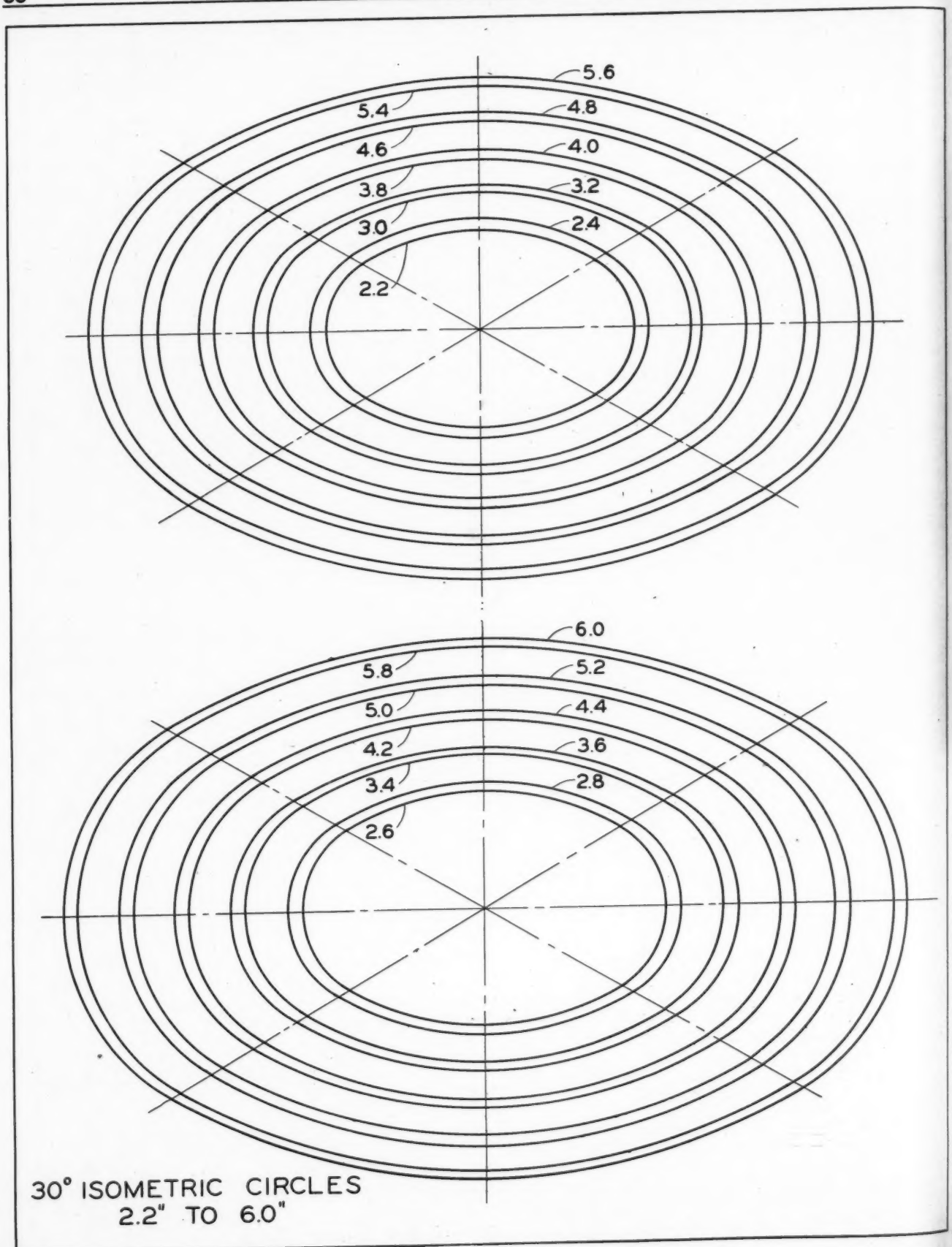
(Continued on page 20A. See also pages 78, 79, and 80)



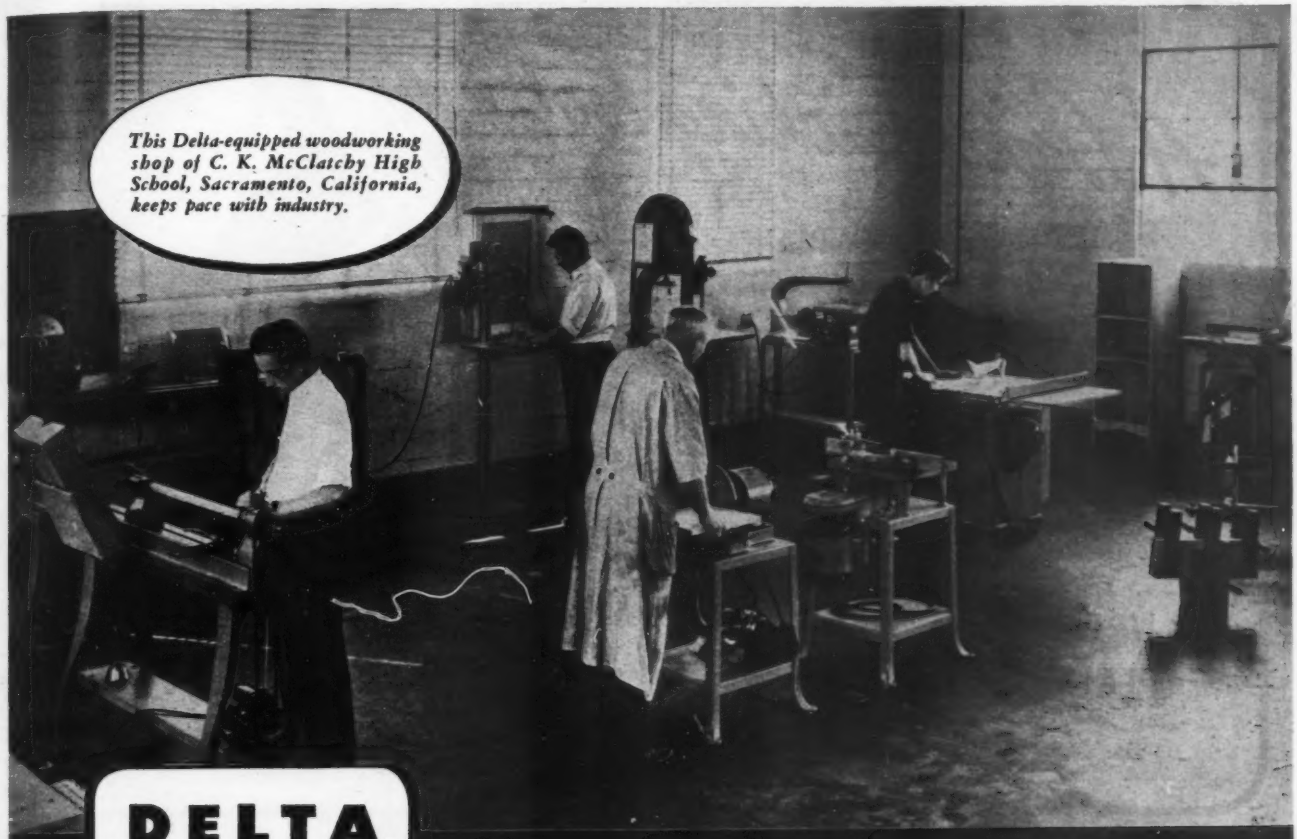
Templates for special curves



Templates for drawing circles of ⅛ to 1 in., and 0.1 to 2.0-in. diameters, isometrically



Templates for drawing circles of 2.2 to 6.0-in. diameters, isometrically



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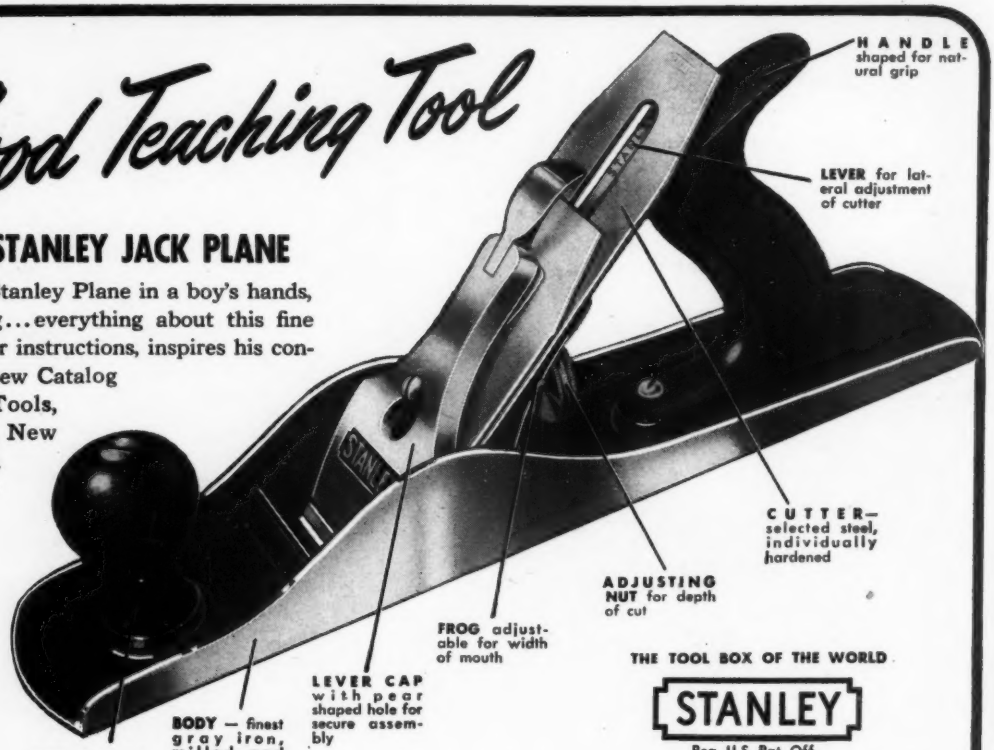
HANDLE shaped for natural grip
LEVER for lateral adjustment of cutter
CUTTER— selected steel, individually hardened
ADJUSTING NUT for depth of cut
FROG adjustable for width of mouth
LEVER CAP with pear shaped hole for secure assembly
BODY — finest gray iron, milled and ground true
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Personal News

BURL LEE DOUGHERTY DIES

Burl Lee Dougherty, 61, principal of the Kosciuszko Junior Trade School, Milwaukee, Wis., for the past 26 years, died recently as the result of a heart attack suffered on November 29, 1946.

Mr. Dougherty was born at Boscobel, Wis., but came to Milwaukee as a child and attended the public elementary and high schools of that city.

In 1911 he received his teacher's certificate from the Milwaukee State Teachers College. In 1928 he received the degree of B.Ph., and in 1940, the M.Ph., from Marquette University, Milwaukee, Wis.

His first teaching position was at Tess Corners, Wis., where he taught for one year. He then went to the state of Washington and served as principal of several schools for 11 years. In 1921 he was appointed the first principal of the first prevocational school which later became known as the Kosciuszko Junior Trade School. The credit of originating Milwaukee's prevocational training program belongs to him.

He is survived by his wife, a son, a daughter, a brother, and a sister.

♦ E. H. CURRY, critic teacher, Wayne University, Detroit, Mich., has accepted an offer to teach at Washington State College, Pullman, Wash., next summer.

♦ The following men completed the work for the master's degree with a major in industrial education at the end of the summer session at Wayne University, Detroit, Mich.: WALTER E. BILLIET, WALTER O. BREED, LINCOLN C. BROWNING, ERNEST COVERDILL, ARTHUR J. ELGES, STANLEY C. FILIPIAK, RICHARD E. GIEBEL, FRED A. KNACK, OLIVER LUEY, OWEN J. MESNER, FREDERICK PREATOR, PAUL L. REBER, and MICHAEL WICHOREK.

♦ The following are teaching featured courses at Wayne University, Detroit, Mich.: WILLIAM STIRTON, Technical Education Programs in the American Schools; DR. HAROLD DAVISON, The History of Industrial Education; FRANK CARPENTER, Co-ordination in Vocational Education.

♦ LOUIE VIERLING, industrial education teacher in the Detroit schools, is in charge of the project called "Vets Incorporated." This group is made up of fifty veterans who are building their own homes. The project started last spring, and several homes have now been completed.

♦ GEORGE REID, a graduate of DeKalb State Teachers College, has been appointed to teach vocational printing at Waukegan Township High School, Waukegan, Ill.

Mr. Reid spent five years in the navy. He has an excellent background of trade experience which he secured working for several commercial printing establishments in the Chicago area upon his graduation from the Lane Technical High School in Chicago.

♦ DR. W. T. REED, principal of the Sussex County Training School at Waverly, Va., since 1944, was appointed to the position of director of trade and industrial education at the Saint Paul's Polytechnic Institute, Lawrenceville, Va.

Dr. Reed earned his B.S. degree at Hampton Institute and his Ed.M. and Ed. D., at the University of Pittsburgh. He began his duties at the Lawrenceville College in June, 1947.

♦ GEORGE MCWATT is enrolled in the graduate school of education at Wayne University, Detroit, Mich.

He teaches industrial arts at the Duffield School, and also serves in the capactiy of a critic teacher for Wayne University.

♦ STIG E. RALSTROM is teaching drafting and civics at Western High School, Detroit, Mich.

♦ JOHN W. BUSMAN is the assistant superintendent of the Henry Ford Trade School, Dearborn, Mich.

♦ GORDON C. GRAHAM is at present a member of the National Education Association Safety Commission.

♦ PAUL LOUMA has started his master's work and expects to complete it in June, 1948.

♦ EARL BROWN is a woodworking instructor at Durfee, and a special instructor at Wayne University, Detroit, Mich.

♦ ADRIAN POLLOCK made important contributions to the Michigan Industrial Education Society survey of films related to graphic arts.

♦ HENRY DOLIBER is a teacher at Wilbur Wright High School, Detroit, Mich. (machine shop), and is the acting assistant of that department. He also teaches Wayne University graduate and undergraduate courses for future machine-shop instructors.

♦ ROBERT GRANT has joined the faculty of Wayne University as assistant professor of engineering drawing, an assignment which he holds at the present time.

♦ HARLYN OLSEN is a graduate student at Wayne University, Detroit, Mich., and expects to obtain his master's degree by June, 1948.

♦ CLIFFORD R. BAKER is teaching household mechanics at Von Steuben Elementary School, Detroit, Mich.

♦ WILLIAM BOYD is teaching industrial arts at the Pattengill School, Detroit, Mich.

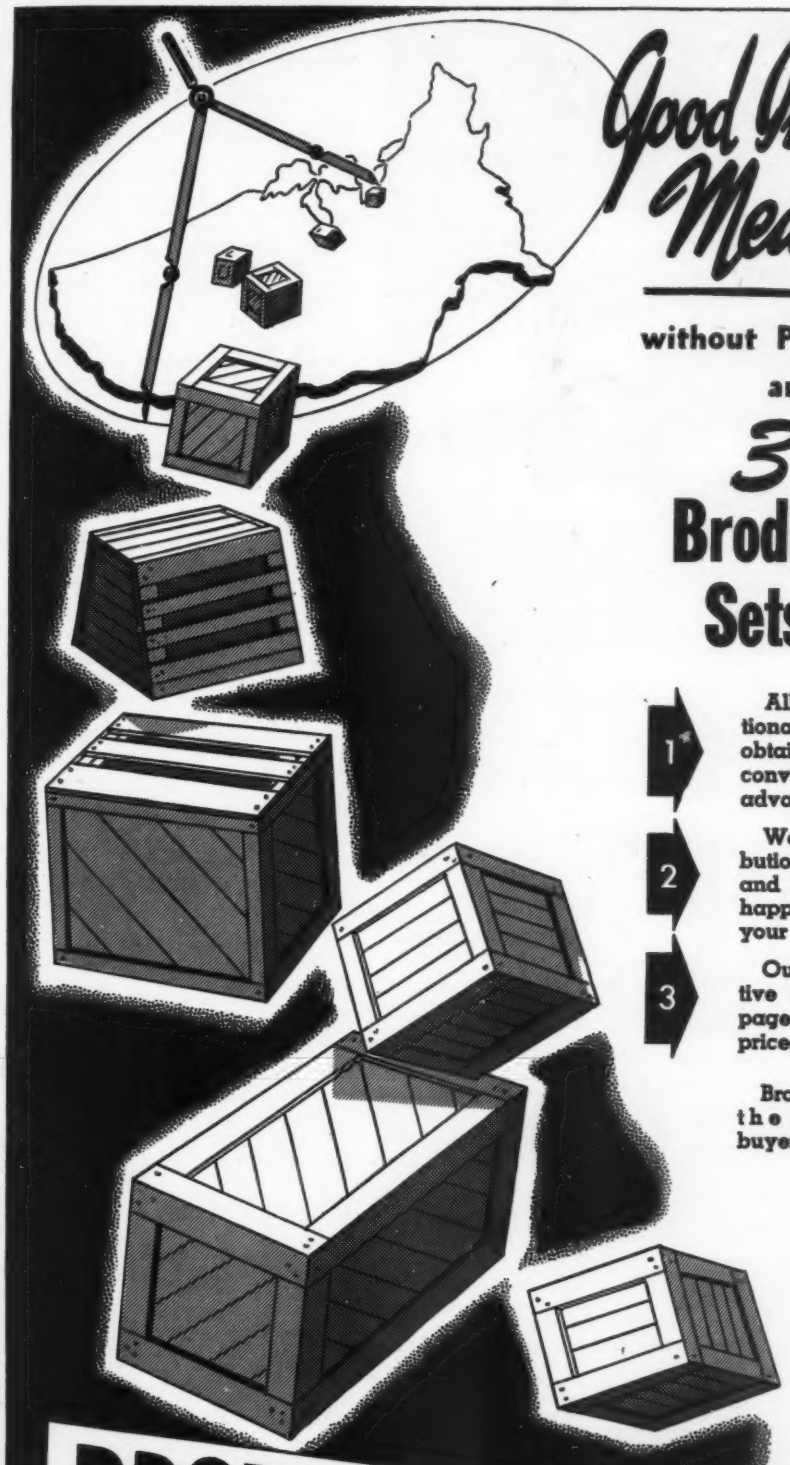
♦ THEODORE STONER is teaching the pretrade classes at Southfield Trade School, Detroit, Mich.

♦ RICHARD RAMSDELL is a machine-shop teacher at Northern High School, Detroit, Mich.

♦ A. O. HINDELANG has charge of gas and arc welding at Northeastern High School, Detroit, Mich.

♦ DONALD LAHTI is a graduate student at Wayne University. He is teaching radio at Nolan Intermediate School, Detroit, Mich.

(Continued on page 18A)



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(Continued from page 16A)

♦ NORMAN ERCKMANN has been appointed district director of the National Association for Printing Education. Mr. Erckmann is at present in charge of printing at the State Teachers College, Silver City, N. Mex.

♦ ELMER CLAUSEN, now teaching in the high school at Vancouver, Wash., has been appointed chairman of the promotion and publicity committee of the National Association for Printing Education.

♦ T. I. MATTHEWS has been appointed welding instructor at Argentine High school, Kansas City, Kans. He has worked at the welding trade for 13 years.

♦ FRANK W. SCOTT is teaching trade auto mechanics in the Argentine High School, Kansas City, Kans. He received his B.S. degree from Kansas State Teachers College, Pittsburg, last spring after having returned from army service.

♦ CARL C. RIGGS, junior college economics instructor at El Dorado, Kans., has been appointed director of the adult evening school program.

♦ CHARLES TERRY has been appointed trades instructor at Sumner High School, Kansas City, Kans.

♦ THOMAS M. MASSEY has been made director of the Great Bend, Kans., adult evening program. Mr. Massey is an instructor in the commerce department.

♦ TOM DEAN has joined the faculty of the Iowa State College, Ames, Iowa, as a shop teacher.

He teaches classes in machine and hand woodworking, and in wood finishing.

♦ C. W. MCINTOSH, who received his M.Ed. degree from Missouri University this past summer, has accepted a position in the industrial-arts department at Memphis State College.

Mr. McIntosh will teach woodworking and act as supervisor of student teachers. Previous to his graduate work at Missouri University, Mr. McIntosh served in the armed forces as a first lieutenant in the Medical Administration Corps of the army.

♦ C. E. ZWICKEY, WALTER JESKE, and DON ZWICKEY are offering industrial education courses at Wayne University, Detroit, Mich., to Catholic nuns in the Detroit area who are qualifying to teach an introductory course in drafting in their secondary schools.

♦ ROBERT SHIELDS has assumed the responsibility for the supervision of printing in the Detroit schools, as well as the duties as department head at Cass Technical High School.

♦ The following men are serving as critic teachers in the Department of Industrial Education, Wayne University, Detroit, Mich.: HERMAN AHO, DONALD BLACK, WILLIAM BOYD, WALTER FREED, ESTELL CURRY, CHARLES POZZINI, CHARLES SECHREST, HARTLEY SCHAAL, EBER SMITH, WARD SMITH, and R. TUCKER.

♦ STANLEY W. SWANSON is a general metal and woodworking instructor at Hutchins Intermediate School, Detroit, Mich.

♦ LEONARD LARSEN is at present teaching drafting at Denby High School, Detroit, Mich.

♦ J. W. WEEKS is teaching industrial arts at Post Intermediate School, Detroit, Mich.

♦ J. C. WOODIN, director of vocational and adult education, Wichita, Kans., was general manager of the Kansas Manufacturers' Show held at the Wichita Forum recently. He also was elected president of the Kansas Manufacturers' Show, Inc., for next year.

♦ E. L. MEADER, assistant director, vocational and adult education, Wichita, Kans., has been re-elected secretary of the Wichita Manufacturers' Association.

♦ HAROLD L. ROYER, commerce instructor, Emporia, Kans., has been appointed director of the evening program by Supt. W. M. Richards. He has organized classes in welding, carpentry apprentices, variety store selling, and credits and collections.

♦ LEE V. DURYEE has been appointed head of the machine shop at Wilbur Wright High School, Detroit, Mich.

He received his B.A. and M.A. degrees from Wayne University.

♦ OSCAR A. FELDEN is teaching household mechanics at Jackson Intermediate School, Detroit, Mich.

♦ WALTER KIZEL is machine shop and drafting instructor at the Condon Intermediate School, Detroit, Mich.

♦ ALBERT B. MULLER is teaching welding, shop mathematics, and woodworking at Slocum Trunk High School, Trenton, Mich.

♦ THOMAS POBANZ is teaching machine-shop practice at Greusel Intermediate School, Detroit, Mich.

Association News

A.V.A. CONVENTION REPORT

The 1947 A.V.A. convention at Los Angeles is now a thing of the past, and the remembrance of the entire affair is a very pleasant one. The 3000 or more who attended the convention could safely say that they had never attended a better A.V.A. convention.

As usual, the National Council of Local Administrators had their executive board meeting a day early. On Monday morning they had a session at which Jesse F. Rees, director, department of vocational education, Harrisburg, Pa., was the chairman.

After a brief business meeting a panel discussion was held. The panel members were Morris E. Siegel, Brooklyn, N. Y.; Edgar J. Spady, Oklahoma City, Okla.; O. H. Day, Kansas City, Mo.; and C. F. Bauder, Philadelphia, Pa. Roy L. Soules, Santa Barbara, Calif., was the recorder.

E. C. Jeppsen, Logan, Utah, was chairman at the afternoon session. Russell K. Britton, Denver, Colo., and L. H. Dennis, executive secretary, A.V.A., Washington, D. C., were the members of

(Continued on next page)

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a panel, at which J. J. Kayetan, Phoenix, Ariz., acted as recorder.

The chairman at the luncheon meeting on Wednesday was Earl L. Bedell, president, National Council of Local Administrators.

This meeting was really the final business meeting of the N.C.L.A., and concluded with the election of officers.

INDUSTRIAL-ARTS EDUCATION

The program cochairmen for this section were George B. Cox, director, industrial arts, Oregon State College, Corvallis, Oregon, and Emanuel E. Ericson, chairman, department of industrial education, University of California, Santa Barbara College, Santa Barbara, Calif. Much credit should be given to these two men because the four programs prepared for industrial-arts members of the A.V.A. were really outstanding and the attendance at each of the sessions was very good.

The general theme for the four meetings was "Industrial Arts as General Education for a Technical Age."

Frank C. Moore, American Vocational Association, Inc., vice-president for industrial arts, presided at the Tuesday morning session at which "The Functions of Industrial Arts Education" was discussed.

The speakers slated for the program were Stanley Pawelek, Baltimore, Md.; W. E. Warner, Ohio State University, Columbus, Ohio; and Lynne C. Monroe, University of California, Santa Barbara, Calif.

The addresses presented the functioning of the industrial arts in guidance, production and consumption, and in recreational activities.

Clifford K. Lush, Minneapolis, Minn., acted as discussion leader.

George B. Cox was chairman at the Tuesday afternoon session at which the "Development of the Industrial Arts Program" was discussed. The speakers on this program were Dewey Barich, Kent State University, Kent, Ohio; Thomas M. Riley, Los Angeles, Calif.; and John R. Ludington, North Carolina State College, and state supervisor of industrial arts, Raleigh, N. C. These speakers presented their views on industrial-arts programs in the elementary school, the junior high school, and the smaller high school.

G. Harold Silvius, Wayne University, Detroit, Mich., acted as discussion leader.

At the Wednesday afternoon session an outstanding demonstration of teaching techniques was presented. The members of the demonstration team — all members of the California Industrial Educational Association — have developed the equipment and the demonstration methods to a remarkable degree, and their efforts of upbuilding the teachers of industrial arts, especially in the smaller communities, is a fine professional piece of work, from which the members of the team receive no monetary returns.

The chairman at this session was Claude E. Nihart, head supervisor, vocational and practical arts, Los Angeles, Calif.

The subjects presented by means of demonstrations were the use of plastics, silk screen processes, developments in electronics, graphic presentations, metalwork design and processes, and the design and construction of small wood projects.

The demonstrators were J. Lyman Goldsmith, Los Angeles, Calif.; Wayne A. Wonacott, Burbank, Calif.; Walter B. Ford, Eagle Rock, Calif.; Fred Baer, Los Angeles, Calif.; Patrick J. Quinn, El Monte, Calif.; Carl W. Wirths, Los Angeles, Calif.; and Dan Mullock, Los Angeles, Calif.

Emanuel E. Ericson presided at the final session on Thursday morning at which the selection and preparation of industrial-arts teachers was discussed.

The following topics were presented: "Selection of Candidates," "Basic Preparation," "In-Service Development," and "Graduate Study."

The speakers on this program were: Kenneth Perry, Colorado State College of Education, Greeley, Colo.; Gordon O. Wilber, State Teachers College, Oswego, N. Y.; Chris H. Groneman, Texas A. & M. College, College Station, Tex.; and Arthur B. Mays, University of Illinois, Urbana, Ill.

DeWitt Hunt, Oklahoma A. & M. College, Stillwater, Okla., was the discussion leader.

The full-day program which E. E. Ericson prepared as a special offering to the industrial-arts teachers for Friday, December 19, at the University of California, Santa Barbara College, will long live in the memories of all those who could participate.

(To be continued)

♦ The 34th meeting of the Manual Arts Conference, held at Hotel La Salle, Chicago, Ill., on November 13, 14, and 15, 1947, was well attended.

The first meeting, at which a "Review of Selected Research Studies" was presented, started promptly at 9:30 a.m.

The general chairman of the Conference was Verne C. Fryklund, president of The Stout Institute, Menomonie, Wis.; and the chairman of the first meeting was C. Kenneth Beach, Cornell University, Ithaca, N. Y. He was ably assisted by Sylvan A. Yager, Indiana State Teachers College, Terre Haute, Ind.

Under "Objectives, Curriculum, and Course Content," 81 titles of research studies were presented.

Under "Guidance, Placement, and Follow-up," there were 16 titles. "Shop Organization" netted 19 titles, "Teacher Activities and Education," 39, "Plans for Co-ordination," 5, and "Programs and General Background," 44.

Dr. Silvius showed results obtained from recording industrial-arts projects on colored transparencies.

At the afternoon meeting Dr. Homer J. Smith was the chairman. The subject for discussion was "Needs, Opportunities, and Problems in Industrial Arts." Dr. Smith, in handling the subject, showed consummate skill in conducting a conference, because he had everyone in the audience actively

(Continued on next page)

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(Continued from page 77)

then be cut deeper freehand until the curve is cut out. However, the drawings of ellipses can be made use of directly by placing under the original tracing paper. Drawings to draw required ellipses or celluloid templates can be made from them. Pieces of old airplane windshield material may be used for these curves but because this material becomes quite brittle with age it is best to use new celluloid wherever possible.

CHINESE INK — ITS PREPARATION AND USE

W. ARTHUR FILLER
John Marshall High School
Richmond, Va.

In the modern drafting room the use of Chinese ink has all but become a lost art. A few artists, photographers, and architects still use this fine grade of ink for spotting and retouching negatives and prints, or for shading architectural drawings, but most draftsmen have turned to the use of modern and convenient waterproof India ink for all work that has to be inked.

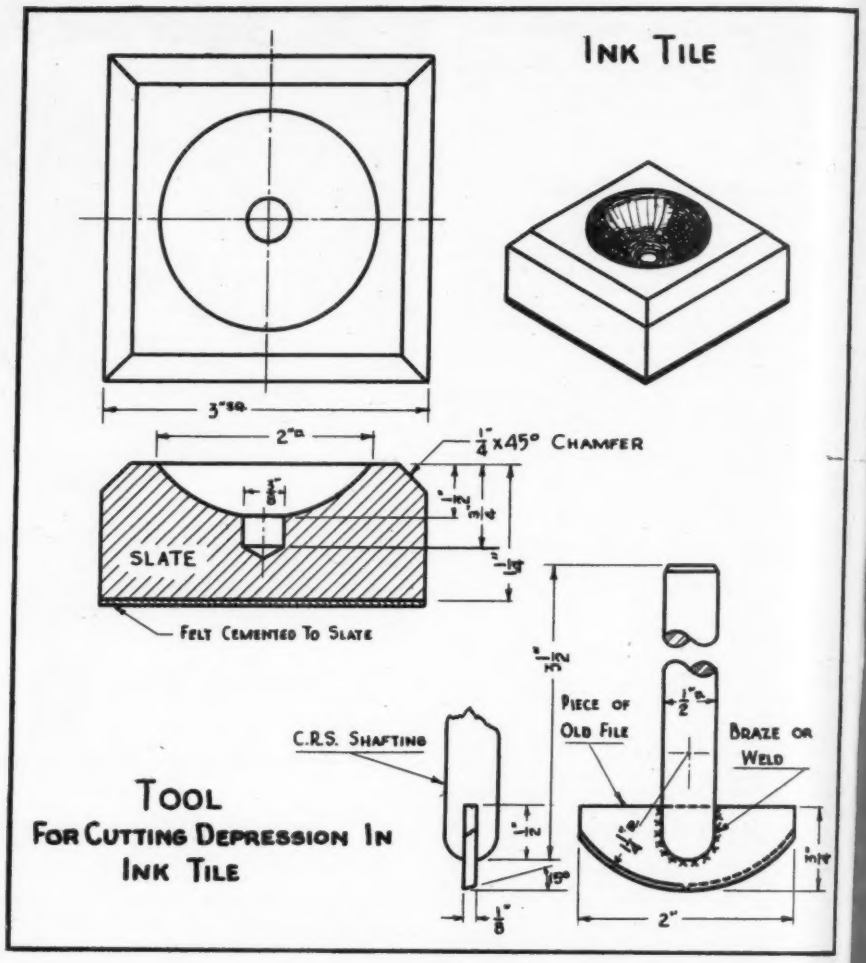
Thirty to fifty years ago all drawings of any value, and especially those that were to be reproduced by blueprinting, had to be inked and the only suitable ink available was Chinese ink. To the office boy, who often was also learning the mysteries of drafting, fell the job of preparing the ink each day. He would arrive before the draftsmen, gather their ink tiles, wash out the remains of the previous day's ink and then grind the ink until each draftsman had his tile filled with a fresh supply for the day.

Chinese ink is usually obtained in a stick of oval cross section and about three inches in length. It is a hard, compact preparation which is easily broken if dropped. At one time it was possible to buy ink in sticks much larger than the present size and in some cases one stick would provide a draftsman with ink for a year. It was customary for each draftsman to have his own stick of ink.

Just prior to World War II a Japanese imitation of this ink appeared on the market. It was rectangular in cross section and larger than the true Chinese ink but was not as dense as the original and therefore it was necessary to use a greater amount of it to produce an opaque solution.

The ink tile was usually a piece of slate approximately one inch thick and about three inches square with a curved depression ground into it. A few individual draftsmen had their own made by the local stone mason of tile or stone of their own selection. The depression should be smooth, but not polished.

Water is placed in the depression and the end of the ink stick is rubbed in a circular motion around the depression gradually grinding off small amounts of ink which goes into solution. This grinding process is continued until the ink solution is sufficiently dense to make an opaque black line. The best test of the quality of the ink solution is to rule a few lines and examine them after they have dried.



Home-made ink tile

The instructor who is interested in demonstrating this ink will find no trouble in making an acceptable ink tile from a piece of slate such as is used for stair treads in many public buildings. School maintenance shops may have such pieces of slate available. Slate is a comparatively soft stone and may be readily cut with a hack saw and finished with sandpaper. The depression may be cut using a tool similar to the one illustrated in a drill press. If a machine lathe is available, the block of slate may be placed in a four-jaw chuck and the depression cut with a round-nose turning tool. It was found convenient to drill a three-eighth inch guide hole deeper than required and use it as a well. The ink may be transferred from the tile to the ruling pen by using an ordinary dip pen.

The author presented a lesson on the preparation and use of Chinese ink to his junior and senior high school mechanical drawing classes at the time they were learning the use of the inking instruments and the students were quite interested. A few students made their own ink tiles to take home to use, perhaps, as paperweights.

ASSOCIATION NEWS

(Continued from previous page)

engaged in the discussion before the presentation was scarcely begun.

John F. Friese was the chairman at the Friday morning session at which the "State Supervision of Industrial Arts" was discussed. He pointed out that there are about 10 or 11 states that have supervisors of industrial arts. The rest of the states do not have supervision although that is very necessary because there are many small communities that badly need to give the isolated shop teacher such service.

The chairman for the Friday afternoon session was Dewey F. Barich. He was ably assisted by Thomas A. Hippaka.

The subject discussed was "Lessons for Industrial Education Drawn From the Experiences of the War Years."

The consensus of opinion was that the army trained — it did not educate. We must do both. Our main business is to educate, to present, explain, demonstrate, test, reteach, and retest.

What the learner has not learned, the teacher has not taught.

At the Saturday morning session, R. C. Woellner acted as chairman, and Dr. Silvius was his teammate on the program. The subject for discussion was "Problems of Graduate Study in Industrial Arts."

Both of these men handed out very much worth-while analyses of their subject.

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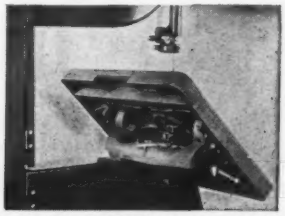
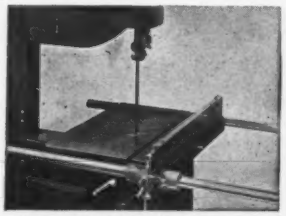
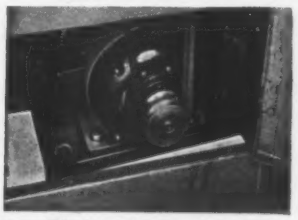


Above, left: Ball-bearing blade guides are fully adjustable — you quickly make precise micrometer adjustments to the finest degree. *Above, right:* Two trunnions spaced 17" apart support 20" x 24" table. Table tilts and locks at any angle up to 45° to the right; 12° to the left.





Above, left: Table has slot for miter gage. Rip fence (an accessory) can also be used. *Above, right:* In V-belt drive machine, motor is mounted in base on pivot bracket which automatically provides correct belt tension. In direct-drive machine, motor is rigidly mounted to the frame.

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. . . in two low-priced, heavy-duty models that are ideal for manual-arts shop use:

1. Direct Motor Drive 2. V-Belt Drive

Helps you accustom students to equipment used in furniture factories, pattern shops, millwork plants, sash and door plants, and other woodworking operations.

It takes 13½" under the top guide. It handles all types of blades up to 1 inch wide. That's the new, big-capacity Crescent 20" Band Saw.

Here's a wood-cutting unit of the high quality you look for from a company that for more than fifty years has specialized in designing and building precision machinery for the woodworking field. And the price is considerably lower than you'd expect.

Crescent has included features that count toward dependable performance — practical features like these:

Welded steel cabinet — a single unit — encloses all working parts: upper and lower wheels, saw blade, motor, etc. Doors provide quick access to wheels and motor.

Adjustable "three-point mountings" are used between working parts and steel frames, to help maintain exact alignment.

Wheels are statically balanced and are mounted in sealed-for-life ball bearings.

Aluminum wheels have minimum momentum after power is shut off.

Convenient foot brake is provided on lower wheel.

Adjustable control on upper wheel maintains proper blade tension. Clear, legible scale indicates tension.

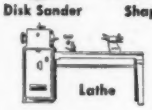
Dust chute carries away dust and chips . . . and can be attached to dust collector.

Your Crescent dealer is ready to give you further reasons why it pays to specify Crescent 20" Band Saws on your requisition for woodworking machinery. See him soon.

Disk Sander

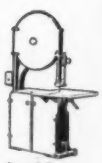
Shaper

Saw Table


Lathe

Jointers (8"-12"-16")

Mortiser


Band Saws (20"-32"-36")

CRESCENT builds a complete line of woodworking machinery:

Free

Bulletin that pictures and describes the Crescent 20" Band Saw. Also catalog of entire Crescent line of woodworking machinery.

CRESCENT MACHINE DIVISION
Rockwell Manufacturing Company
Leetonia, Ohio

CRESCENT MACHINE DIVISION
802 Pine Street, Leetonia, Ohio

Send me free Bulletin CMC-3 and also catalog of Crescent Woodworking Machinery.

Name.....

Position.....

School.....

Address.....

City.....(. .) State.....

CS-10

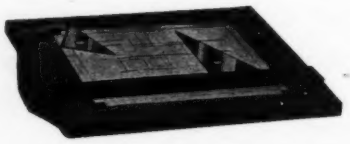
Professional Drafting Equipment

For the Modern Classroom!

THE REGAL T-SQUARE

A low cost, good quality T-Square. It compares favorably with more expensive units. Blade is attractively finished in brown. Head is of lustrous black plastic. Entire unit is rigid and accurate.

STUDENT DRAWING KIT



This kit has an extra fine drawing board, a well constructed and serviceable all-plastic T-Square, and two plastic triangles. Two wood cleats on underside of board hold the T-Square when not in use. A spring clip holds the triangle.

DRAFTING TABLES

STURDY DURABLE

Model illustrated is our well-known Wood Base Table. This table is solidly constructed and will stand abuse. All models now have tubular tilting units and knob height adjustment. Available 5-ply Basswood top sizes are from 21" x 26" through 42" x 72".

Metal base table top sizes are 24" x 30", 24" x 36", and 30" x 42". The famous 5-ply basswood board, as well as the tubular tilting units and knob height adjustments, are also standard in this model table.

Both tables are well built products and ideal for classroom requirements. Metal tool drawers can be had for these tables.

ENGINEERING MANUFACTURING COMPANY
623 No. Commerce St. Sheboygan, Wis.

Precision Tools for tomorrow's Craftsmen!

SHOP BOOKS

GENERAL SHOP WOODWORKING
REVISED, 1946 By Fryklund & La Berge

Hand woodworking for the beginner. Clear, step-by-step instruction organized in teaching units. Many valuable drawings. Contains important related and occupational information. 25 projects. $1.00

GENERAL SHOP METALWORK
REVISED, 1947 By Dragoo & Reed

Unit organization of elementary bench, sheet, art and ornamental metal. Step-by-step procedures for many projects included. These projects require a minimum of material in their construction. New edition greatly enlarged. Provides enough material for a unit course. $1.00

GENERAL SHOP ELECTRICITY
REVISED, 1946 By Dragoo & Dragoo

Beginner's text in practical electricity. Written in short teaching units. Covers wiring diagrams, circuit layouts, standard electrical connections, safety rules, standard practices and newly added material on radio. $1.00

GENERAL DRAFTING By Fryklund & Kelper

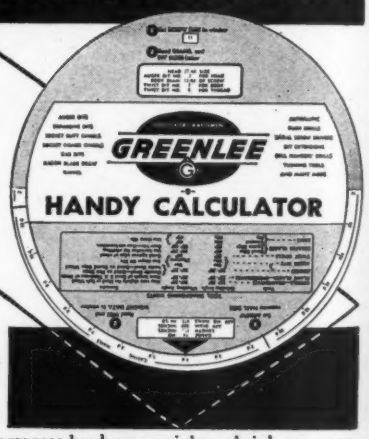
Year's course in beginning drafting. Clear, basic instruction on drafting fundamentals — lettering, ruling, spacing, etc., as well as standard drafting principles. Many problems presented — electrical, radio, architectural, sheet metal, etc. $1.00

McKNIGHT & McKNIGHT

Dept. A-4 Bloomington, Illinois

Solves Woodworking Problems Fast!

only **10c** SPECIAL OFFER



• Just set the dial and the GREENLEE Handy Calculator quickly converts linear to board feet . . . determines slope per foot in degrees . . . compares hardness, weights, shrinkage, warping, workability of various woods.

Gives bit sizes for head, body, thread of screws . . . nail specifications . . . tool sharpening tips. Easy to work . . . saves time. 6" in diameter . . . heavy varnished cardboard. Special offer by makers of famous GREENLEE high-quality tools. Send 10c today (not stamps) with your name and address to Greenlee Tool Co. 2022 Twelfth St., Rockford, Ill.

Remember—GREENLEE is the name for dependable high-quality tools.

GREENLEE

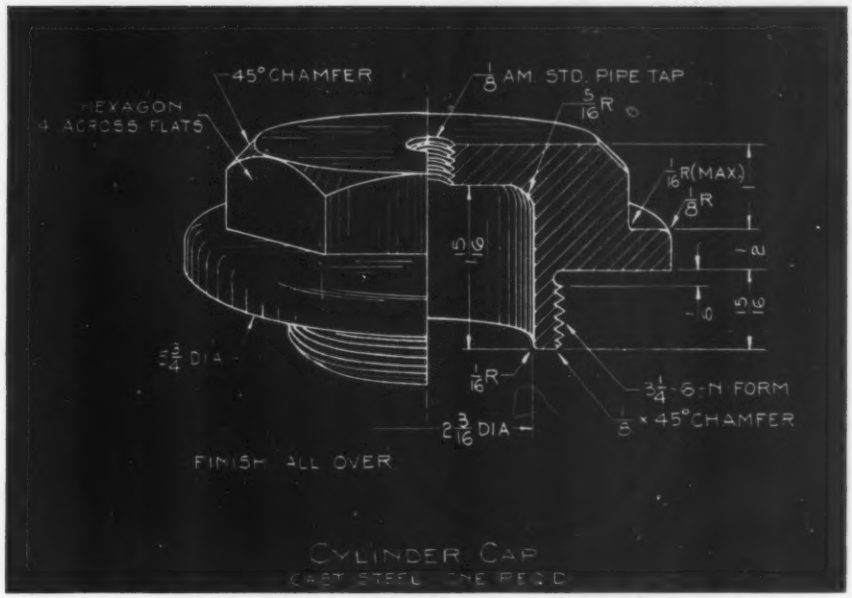
No. 1 Attention Getter!

Cylinder Cap Problem — first in the new 1948 series of the Eldorado Problem and Solution Service! Practical and interest-provoking... your class will enjoy working out the correct orthographic solution.

Don't forget we send *free* Eldoradostats of both problem and solution . . . from which you can make blueprints for classroom distribution.

And remember TYPHONITE ELDORADO pencils are good for the work to be done by your students. These responsive and dependable pencils *will bring out their best.*

DIXON'S
TYPHONITE
ELDORADO



If you are not already receiving these problems, write to the address below and your name will be placed on our mail ng list.

SCHOOL BUREAU, PENCIL SALES DEPT., 128-J2, JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.

(Continued from page 20A)

At the business session a new name for the conference was adopted. It is henceforth to be known as Industrial Arts Conference of the Mississippi Valley.

The following are the names of the new members who were admitted: Nelson Houer, Louisiana; Asbury Smith, Oklahoma; Dr. Fred Strickler and Dr. Bicknell, Illinois.

George Allen Frecker, secretary of education, Newfoundland, attended the entire conference. He was made an associate member.

♦ A conference on industry-science teaching relations, in which representatives of industry and teachers learned at firsthand how they could cooperate to achieve sound scientific education, was held at the Hotel Sherman in Chicago at 1:30 p.m., Sunday, December 28, under the sponsorship of the National Science Teachers Association.

Dr. Morris Moister, president of the N.S.T.A., and principal of Bronx High School of Science; Dr. Thomas H. Briggs, director of Consumer Education Study of the National Association of Secondary-School Principals, and formerly professor of education at Columbia University; and Ivan L. Willis, vice-president in charge of industrial relations for the International Harvester Co., were the speakers.

G. Edward Pondray, New York public relations counsel, presided.

♦ The Graphic Arts Club of the High School at Hutchinson, Kans., was organized in October, 1947. The purpose of this club is (1) to create school-wide appreciation of printing as an art; (2) to encourage the entrance of qualified students into the printing industry; (3) to foster high standards of scholarship among printing students and high quality craftsmanship among members of the class in vocational printing; (4) to broaden the knowledge and interests of the members in the field of graphic arts; and (5) to help meet the social needs of the members of the organization.

(Continued on page 26A)

Members and Guests at the 34th Annual Meeting of the Industrial Arts Conference, La Salle Hotel, Chicago, Illinois, November 13, 14, and 15, 1947

Front row (reading from left to right) — Arthur B. Mays, University of Illinois, Urbana, Ill.; John J. Metz, Industrial Arts and Vocational Education, Milwaukee, Wis.; Homer J. Smith, University of Minnesota, Minneapolis, Minn.; William T. Bawden, State Teachers College, Pittsburg, Kans.; Verne C. Fryklund (Chairman), The Stout Institute, Menomonie, Wis.; Robert C. Woellner, University of Chicago, Chicago, Ill.; Clyde A. Bowman, The Stout Institute, Menomonie, Wis.; Thomas A. Hippaka, Iowa State College, Ames, Iowa; John F. Friese, Pennsylvania State College, State College, Pa.

Second row — S. M. Dell, McPherson College, McPherson, Kans.; Nelson A. Hauer,* University of Louisiana, Baton Rouge La.; G. A. Frecker,* Department of Education, St. Johns, Newfoundland; Charles R. Kinison, Ohio University, Athens, Ohio; Walter J. Klehm, State Teachers College, Charleston, Ill.; Asbury Smith,* Central State College, Edmond, Okla.; Sylvan A. Yager, State Teachers College, Terre Haute, Ind.; Wm. J. Micheels, University of Minnesota, Minneapolis, Minn.; Ray M. Stombaugh, State Normal University, Normal, Ill.; Harry A. Pederson, State Teachers College, Platteville, Wis.; Kenneth L. Bing, State College, Cape Girardeau, Mo.; Fred Strickler,* Bradley University, Peoria, Ill.

Third row — Daniel J. Crowley, State University, Bowling Green, Ohio; Fred J. Schmidt, State Teachers College, Muncie, Ind.; Wayne Wetzel, State Teachers College, Macomb, Ill.; Otto C. Olsen, State Teachers College, Kearney, Neb.; G. Harold Sylvius, Wayne University, Detroit, Mich.; William C. Bicknell,* Southern Illinois University, Carbondale, Ill.; Victor Randel, State Teachers College, Huntsville, Tex.; L. T. Smith, State Teachers College, Bowling Green, Ky.; Roland M. Torgerson, State University, Bowling Green, Ohio; M. E. Franklin, Northeastern State College, Tahlequah, Okla.; Dewey F. Barich, State University, Kent, Ohio; C. S. Johnson, State Teachers College, Platteville, Wis.; C. Kenneth Beach, Cornell University, Ithaca, N. Y.

*New members admitted November 15, 1947.

American Tech's QUESTION BOX

Needs Practical Aids for Apprentices

QUESTION: The text material I have examined for building trades apprentices appears to be of the project type rather than of the practical type that matches the trainees on-the-job-experiences. Have you any suggestions?

ANSWER: *We can assure you that FUNDAMENTALS OF CARPENTRY (Vols. I & II) which we have just published is as practical as a plumb line. It anticipates on-the-job needs and problems of the apprentice — gives him the background so important in becoming a skilled craftsman. At the same time it does provide shop projects for those courses which can not have large construction programs.*

Student-Learner Clubs

QUESTION: Do you have any information on Student-Learner Clubs?

ANSWER: *The organization, suggested programs, and even a sample constitution for a Student-Learners' Club are included in C. E. Rakestraw's TRAINING HIGH-SCHOOL YOUTH FOR EMPLOYMENT.*

Masonry Aids Are Antiquated

QUESTION: I have contacted publishers as well as associations in an attempt to find modern books for my masonry course. Why doesn't some one do something about the antiquated teaching aids in the field?

ANSWER: *We have. During January we published a two-book series titled MASONRY SIMPLIFIED by Dalzell and Townsend, and you know the reputation these authors have for developing modern, teachable, how-to-do-it, courses.*

Students Can't Read

QUESTION: Every instructor in our school is required to give some time to improving students' reading ability. Although we are well supplied with forms for reporting progress, we have very few aids to use in accomplishing this improvement. Do you have anything that would help?

ANSWER: *You are not alone. Some instructors have reported that almost 50% of their time was spent teaching students to read. That was why we published HOW TO READ FOR SELF-IMPROVEMENT. It provides a real "working plan for improving reading ability."*

Please send me the books checked below on 30 days examination. If any of the books are adopted and 12 or more copies ordered, I will retain the adopted book as a desk copy, otherwise I will return them or remit less the educational discount.

FUNDAMENTALS OF CARPENTRY — Tools, Materials, Practices. *By Durbahn* Price, $3.25
FUNDAMENTALS OF CARPENTRY — Practical Construction. *By Durbahn* Price, $4.25
TRAINING HIGH-SCHOOL YOUTH FOR EMPLOYMENT. *By Rakestraw* Price, $3.50
MASONRY SIMPLIFIED — Tools, Materials, Practices. *By Durbahn* Price, $4.50
MASONRY SIMPLIFIED — Practical Construction. *By Durbahn* Probable Price, $5.00
HOW TO READ FOR SELF-IMPROVEMENT. *By Levin* Price, $2.75; Study Guide $1.25

Name .....
School .....
School Address .....

AMERICAN TECHNICAL SOCIETY
Drexel Ave. at 58th St.
Dept. W305, Chicago 37, Ill.

News Notes

♦ Teaching aids for the 1947–48 school year are described in a new booklet available to high school teachers from School Service, Westinghouse Electric Corporation.

Educational materials listed in the catalog include booklets, charts, motion pictures, and slide films for use in science, home economics, vocational agriculture, and industrial-arts classes, and general assemblies. Many of the booklets may be obtained in quantities for distribution to students, either free or at a very low price. Teachers' copies are generally free. Order blanks for requesting material are included in the catalog.

Teachers may obtain a copy of the new *Teaching Aids* catalog through School Service, Westinghouse Electric Corporation, 306 Fourth Avenue, Pittsburgh 30, Pa.

♦ Information on a new career field, *Industrial Recreation,* by Jack Granofsky, is now available to vocational counselors, teachers, students, veterans, and all interested, in a new Occupational Abstract, just published by Occupational Index, Inc., New York University, New York 3, N. Y. The six-page leaflet costs 25 cents.

♦ A series of five-day Regional Air Conditioning schools will be conducted by Frigidaire Division of General Motors for district and dealer engineering personnel throughout the country during December and January.

The first training period was held by the central region, in Dayton, Ohio. Similar schools were conducted by the southwestern region at Fort Worth, Tex., on December 8, and by the Pacific region at Oakland, Calif., on January 5. The eastern region will hold its training school at New York City, January 19, and the southeastern region at Atlanta, Ga., on January 26.

The training courses will be in charge of a factory team, comprised of E. J. Boyer and R. Woodward, air conditioning sales representatives.

The courses will cover "Fundamentals of Air Conditioning," including such phases as "Theory," "Air Distribution," "Determining Refrigeration Loads," "Selection of Equipment," "Product Application," and "Installation."

♦ An instructive story entitled "Sailplane," in color, of peacetime gliding has just been released by Simmel-Meservey, Inc., 321 South Beverly Drive, Beverly Hills, Calif., as the newest film in their science series.

Scenes and narration take the spectator through complete take-off, soaring, and landings. Other step-by-step sequences touch upon construction, assembly, safety features, and wind currents.

The film is 11 minutes in length and available in color or black and white. It was produced by James H. Love and John W. Love.

♦ The 1948 Scholastic Industrial Arts Awards rule book for junior and senior high school students is now obtainable by writing to George H. Fern, Director, Scholastic Industrial Arts Awards, 220 E. 42nd St., New York 17, N. Y.

The deadline for shipping entries is June 20, 1948.

♦ Printed copies of Douglas Fir Plywood (seventh edition), Commercial Standard CS45-47, are now for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for ten cents each.

The present edition covers detail grading requirements for seven grades of exterior type and five grades of interior type Douglas fir plywood, as well as tests and requirements for the two types of bondage.

A chart is included showing the types and grades that are generally suitable for a large list of uses, and suggestions are given on ordering plywood so as to prevent misunderstandings. Facsimiles of the markings employed by members of the Douglas Fir Plywood Association to denote and identify the several grades, also are shown.

NUMBER OF BUILDING TRADES APPRENTICES STILL INCREASING

Continued good co-operation between contractors, unions, state and federal apprenticeship agencies has brought the number of apprentices employed on December 1 in the building trades to another all-time high, 112,221, the Apprentice-Training Service, U. S. Department of Labor, announced recently.

The December 1 total, which was compiled from 5949 reports from all parts of the country but does not represent complete coverage, is a 2.3 per cent increase over the 109,717 listed by ATS on November 1. All of the trade groups showed an increase during November except the electrical trades which showed a slight decrease.

The woodworking trades, which are in the lead, also showed the greatest increases during November, when more than 1400 apprentices were added to bring the total up to 41,065. A breakdown of the number of apprentices in training December 1 in the other building trades in the areas reported follows:

Pipe trades	16,966
Electrical trades	16,937
Trowel trades	15,479
Painting trades	8,967
Sheet-metal trades	8,029
Other building trades	4,778

♦ Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y., has just published the "Personnel Management and Industrial Relations Guided Study Course" by Herbert G. Heneman, Jr., consisting of the book "Personnel Management and Industrial Relations" by Dale Yoder, the pamphlet "Labor Management Relations Act, 1947," and Heneman's 80-page "Study Guide" which coordinates material in the book and the pamphlet by use of instructions and assignments.

Mr. Heneman is research associate and assistant director of the Industrial Relations Center at the University of Minnesota and has worked for many years with Dr. Yoder, whose book is included in the course.

The course is the latest of the Prentice-Hall Guided Study Series and is designed for use by industrial concerns in training personnel department employees as well as college classes and home study.

♦ Juvenile workers employed in factories and workshops throughout Palestine will have increased opportunities for vocational training as a result of an agreement recently signed between Histadrut and the Palestine Manufacturers Association. The pact provides that juvenile workers be released from their employment for a certain number of hours each week without such hours being deducted from their wages, to attend vocational training courses.

As a result of the advanced training, wages will be readjusted each year on the basis of annual proficiency tests conducted by an examining board which includes representatives of the respective trade-unions, the Working Youth Federation, and the Manufacturers Association.

♦ "How to Select Coatings for Aluminum" is discussed in an article by Rav Swan and N. P. Ruther of the Research Staff of the Watson-Standard Co., Pittsburgh, Pa. Finishes for aluminum must be prescription compounded for that use alone, since aluminum possesses certain peculiar properties which make even first grade coatings for steel unsuitable for use with the light metal.

The article deals with aluminum castings, extrusions, forgings, sheets, and foil and considers both functional and decorative coatings. A copy of the article will be sent without obligation upon request.

♦ Instructors supplied by the industrial training division of Carboloy Company, Inc., Detroit, Mich., the Bardons and Oliver Turret Lathe Co., Caterpillar Tractor Co., Carborundum Co., and the Do-All Co., gave demonstrations on the design and use of Carbide tools to the vocational teachers of the state of Illinois, during a workshop conference held recently at the Peoria Vocational School, Peoria, Ill.

New Publications

Simplified Perspective

By William W. Turner. Cloth, 236 pp., 6⅜ by 9⅛ in., illus., $5. The Ronald Press Co., New York, N. Y.

The author of this book, with years of experience as architect and teacher, has produced a book which gives the theory as well as practical applications of perspective drawing.

The book is divided into eight chapters which treat the subject matter under the following headings: perspective elements, oblique lines and planes, parallel perspective, perspective plan method, circles and arcs, reflections, shades and shadows, and perspective auxiliaries.

Each chapter is accompanied by review questions and problems, and by many excellent illustrations so that the student is given every opportunity to get a firm grasp on the subject.

Sprouting Your Wings

By Bruce H. Guild. Paper, 114 pp., 7½ by 10 in., illus., $1.32. McGraw-Hill Book Co., Inc., New York, N. Y.

A unit prepared under and for the committee on experimental units of the North Central Association of Colleges and Secondary Schools. This unit was prepared especially for junior high and first-year senior high students.

The first chapter discusses the forces acting on an airplane; the second, what is needed to be a pilot; the third, how the pilot finds his way in the sky; the fourth describes the hazards of the weather; and the fifth, airplane engines.

Airbrush Illustration

By Ben Jorj Harris. Cloth, 78 pp., 7 by 10 in., illus., $4. The Manual Arts Press, Peoria, Ill.

A book that will be found useful both by the learner and by the professional. It explains by word and illustration how to get underway with the airbrush, how to make black and white pictures, how to use color, and how to retouch photographs. The book contains a number of actual studies made by the author for national advertisers. Some of these examples are in color.

DoAll Contour Saws

Prepared by the DoAll Technical Institute. Cloth, 516 pp., 6 by 9 in., illus. The DoAll Co., 254 No. Laurel Ave., Des Plaines, Ill.

This is the twelfth edition of this handbook which describes the methods used for contour sawing and filing, high speed sawing, and the friction cutting methods with band-sawing equipment.

The second part of the book contains a full course that may be used in training apprentices and machinists. Twenty-three projects are presented in this section.

Photoelectric Cells

By A. Sommer. Cloth, 104 pp., 5½ by 8⅝ in., illus., $2.75. Chemical Publishing Co. Inc., Brooklyn 2, N. Y.

A description of the emission type of photoelectric cells.

The book describes the manufacture of some types of photoelectric cathodes, the measurement and matching of light sources, vacuum and gas filled photo cells, multiplier photo cells, and the application of photo cells.

Modern Radio Instruments and Testing Methods

By the Technical Staff of the Coyne Electrical and Radio School, 500 South Paulina St., Chicago 12, Ill. Cloth, 349 pp., 5¾ by 8½ in., illus., $3.50.

A book that can be used as a text by the student or as a reference book by the experienced radio repairman.

It is profusely illustrated and the explanations are expressed in clear understandable terms.

The subject matter covers: indicating meters — their operation and care; measurements with direct current, low frequencies, high frequencies,

(Continued on page 26A)

DRILLING OPERATIONS CAN BEST BE TAUGHT ON THE DRILLING MACHINE USED IN INDUSTRY!

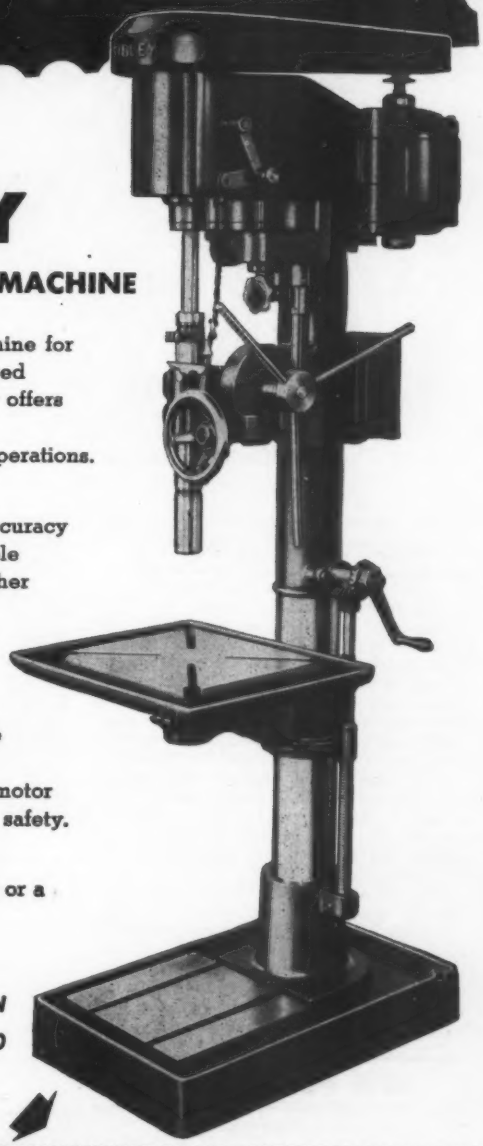
MODEL C-20
SIBLEY
20" SWING DRILLING MACHINE

Here is the practical drilling machine for vocational training. As a widely used industrial machine tool, the Sibley offers the vocational student a basic preparation in industrial drilling operations.

By gaining a familiarity with the controls of this machine, and its accuracy and speed, the student will be able later to step more quickly into higher rated jobs in the shop!

Convenient access to controls permit safe, easy operation. Geared power feeds are selected by merely turning a knob. Change of speeds is quickly made by convenient shifting of V-belt. The motor and drive are enclosed to assure safety.

The model C-20 Sibley is modest in cost—permits installation of one or a battery at a low investment!



GET COMPLETE INFORMATION ON THE SIBLEY MODEL C-20

SEE HOW IT WILL ADD TO YOUR SHOP PROGRAM!

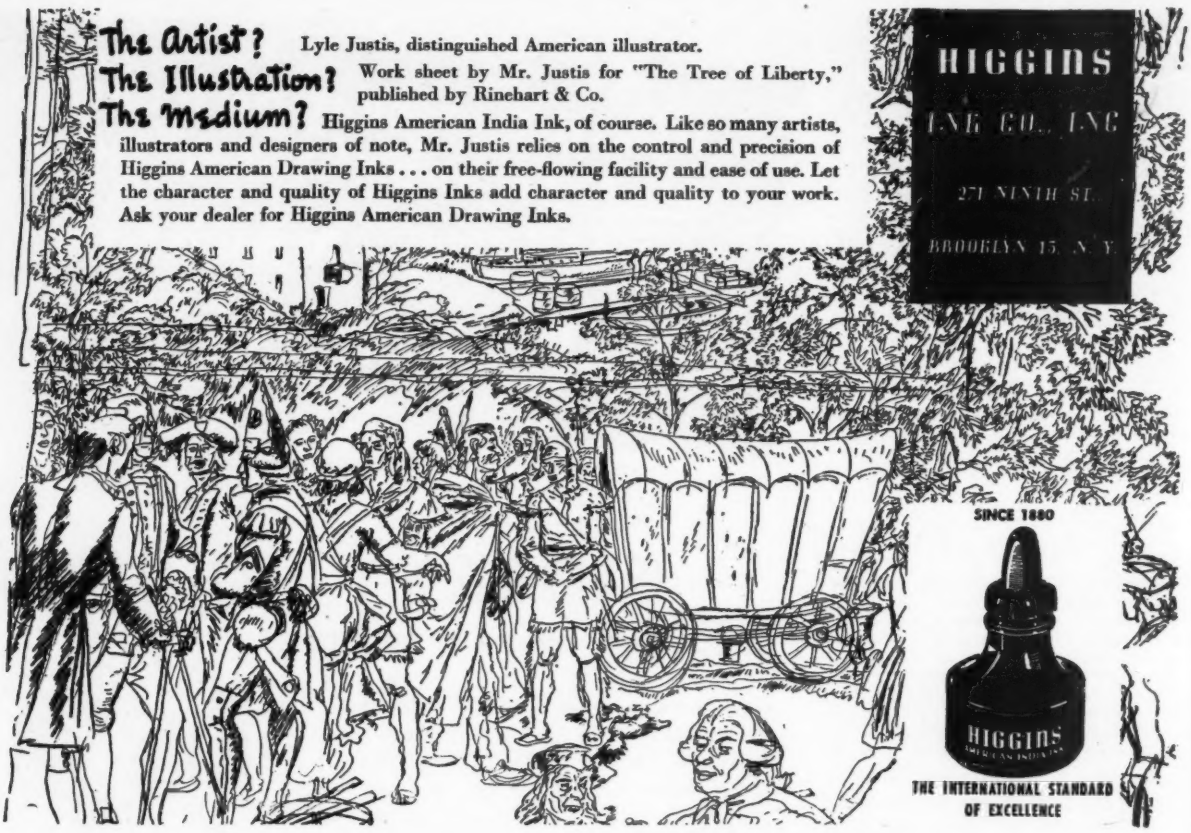
SIBLEY
MACHINE & FOUNDRY CORP.
44 EAST TUTT STREET
SOUTH BEND 23, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
44 East Tutt Street, South Bend 23, Indiana
Please send Catalog No. 67, Free!

NAME_____

SCHOOL_____

CITY_____ STATE_____


The Artist? Lyle Justis, distinguished American illustrator.
The Illustration? Work sheet by Mr. Justis for "The Tree of Liberty," published by Rinehart & Co.
The Medium? Higgins American India Ink, of course. Like so many artists, illustrators and designers of note, Mr. Justis relies on the control and precision of Higgins American Drawing Inks . . . on their free-flowing facility and ease of use. Let the character and quality of Higgins Inks add character and quality to your work. Ask your dealer for Higgins American Drawing Inks.
HIGGINS
INK CO., INC.
271 NINTH ST.
BROOKLYN 15, N. Y.
SINCE 1880
HIGGINS
THE INTERNATIONAL STANDARD OF EXCELLENCE

ASSOCIATION NEWS

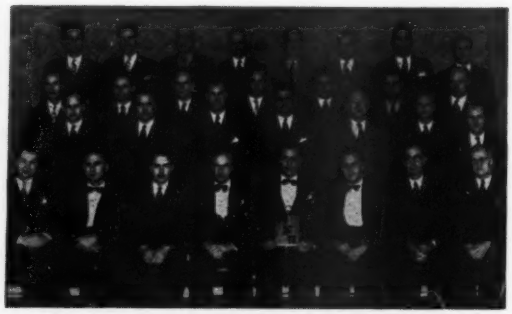
(Continued from page 23A)

Club meetings are held the first and third Wednesdays of each school month. Projects thus far include: (1) printing of colorful placards (proverbs) which are posted in the various schools throughout the city; (2) visiting the commercial print shops of Hutchinson and making oral reports of these visits; and (3) the printing of membership cards and stationery for the organization.

♦ The 16th Annual Initiation and Banquet was attended by the largest gathering in the history of Mu Sigma Pi. It was held on November 7, 1947, in Detroit, Mich., at the famous old Botsford Inn (restored by the late Henry Ford in 1924).

The principal speaker was Crosby Kelly, director of training, Ford Motor Company.

Frederick E. Searle, an honorary member of Mu Sigma Pi, and the former superintendent of the Ford Motor Company's Industrial Schools, gave a most inspiring tribute to the late Henry Ford, who had also been an honorary member of our fraternity.



Sixteenth Annual Convention of the Mu Sigma Pi New Members

Bottom row (left to right) — Stig Ralstrom, Earl Brown, Edwin Polk, Andrew Althouse, faculty adviser, William Wiley, president, Gordon Graham, Dio Duryee, William Boyd.

Second row — Oscar Felden, Raymond Whiting, Stanley Swanson, Walter Kizel, Theodore Stoner, Paul Luoma, Fred Nicholson.

Third row — Clifford Baker, George McWatt, Robert Grant, J. W. Weeks, Donald Lahti, Richard Ramsdell, John Busman.

Top row — Leonard Larson, Adrian Pollock, O. A. Hinderlang, Thomas Pobanz, Arthur Muller, Harlyn Olson, Jose Alvarenga, Gilbert Western.

Initiation held at Botsford Inn, November 7, 1947

NEW PUBLICATIONS

(Continued from page 25A)

and with bridges; analyzers, multimeters, and electronic voltmeters; signal tracing, signal generators and test oscillators; tube testing; cathode ray oscilloscopes and oscillographs; and oscilloscope tests and measurements.

Toys: Their Design and Construction

By J. Kay and C. T. White. Cloth, 125 pp., 7½ by 10 in., illus., $3.65. The Manual Arts Press, Peoria, Ill.

A book written for use in handicraft centers. The authors aimed especially at making popular the use of salvaged materials of all kinds. They succeeded in collecting a large number of simple and interesting projects which would please both students in school shops and home-shop workers.

Many of the things described can be made for use in day nurseries and as playground equipment for the small tots.

An Approach to Radio

By J. B. Shrewsbury. Cloth, 288 pp., 6¼ by 9 in., illus. Electronics Industries, Princeton, Ky.

This book is intended to give the beginner a working knowledge of the fundamental principles of radio without going unnecessarily into the mathematical and scientific elements of radio transmission and reception. It may be used as a school text or for self-instruction.

The book is well illustrated and the descriptive matter is kept as simple as possible.

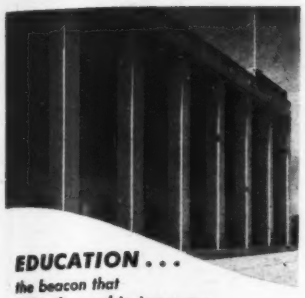
Work Routing, Scheduling and Dispatching in Production

By John Younger and Joseph Geschelin. Cloth, 168 pp., 6⅛ by 9½ in., illus., $3.50. The Ronald Press Co., New York, N. Y.

This is the third edition of this helpful book for aiding production men in carrying out their work. It describes simply and clearly how to route the work, how to economize in the use of materials, how to analyze operational jobs, and how to determine when special machines are required to economize in production work.

Cost accounting and planning, the Gantt chart in work routing, the setting of company policies, the making of tools, jigs, and fixtures, the handling of materials and production personnel, and similar production problems are all quite fully presented.

In the fall and winter months only 24 pedestrians are killed in traffic accidents in the three hours immediately before sunset for each 100 who die in the three hours just after sunset. — *Safety News.*



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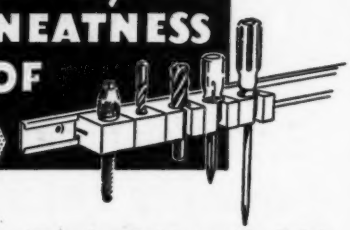

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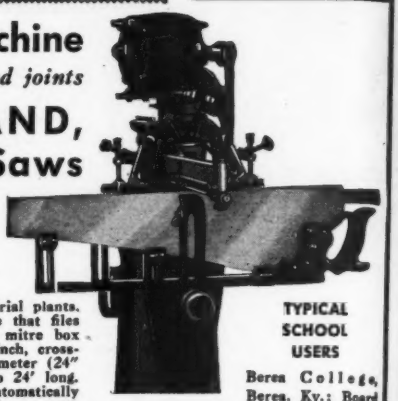

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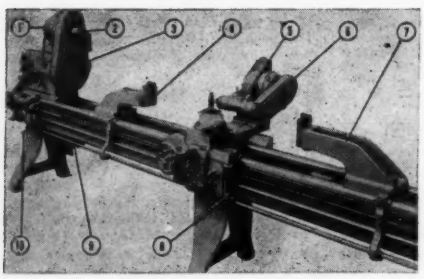
Shop Equipment News
NEW PRODUCTS — PUBLICATIONS

NEW TWO-PURPOSE LATHE

A new two-purpose lathe which not only polishes rubber printing rollers on a production basis, but also performs standard engine lathe metal turning as well, has just been announced by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.

Although designed especially for polishing rubber rollers, this Regal lathe may be used also for standard engine lathe turning. LeBlond Regals are available in six swing sizes, from 13 to 24 in., but the polishing machine is usually built on the 19-in. model which swings 19¼ in. over the ways with beds any length starting at 6 ft.



Two-purpose lathe

LeBlond Regals are built with eight-speed geared headstock; quick change box; lead screw and feed rod; one-piece apron with positive jaw-feed clutch; one-shot lubrication to apron, carriage, and bedways; and other modern lathe features. Complete motor drive, including main drive motor, is furnished as standard equipment on all models.

For brief reference use IAVE—0201.

NEW DELTA BAND SAW

A new heavy-duty production 20-in. band saw was recently announced by the Delta Manufacturing Division of the Rockwell Manufacturing Co., Milwaukee, Wis.

Built in both direct-motor drive and V-belt drive models, the band saw will take blades up to 1 in. in width and has a capacity of 12½ in. under the top guide. The aluminum wheels, balanced to reduce vibration, are mounted in permanently sealed ball bearings. They may be stopped quickly with the foot brake on the lower wheel. An adjustment control on the upper wheel keeps the blade at the proper tension, clearly indicated on a legible scale.

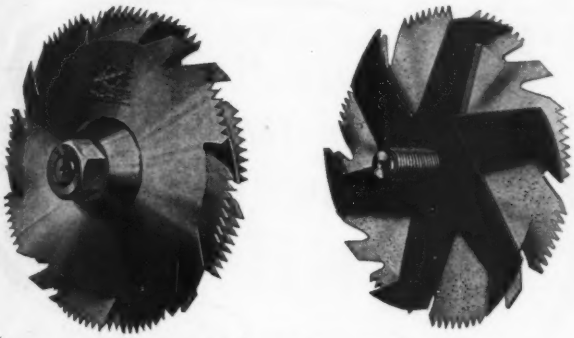
The power unit in both models is contained in a welded steel cabinet, with doors providing easy access to wheels and motor. In the direct-drive unit, the motor is rigidly mounted to the frame. To assure correct and automatic belt tension, the motor in the V-drive band saw is mounted on a pivot bracket in the base.

Supported by two trunnions, 17 in. apart, the

New Delta Band Saw

20 by 24-in. table tilts, and locks at angles up to 12 degrees to the left and 45 degrees to the right.

(Continued on page 30A)



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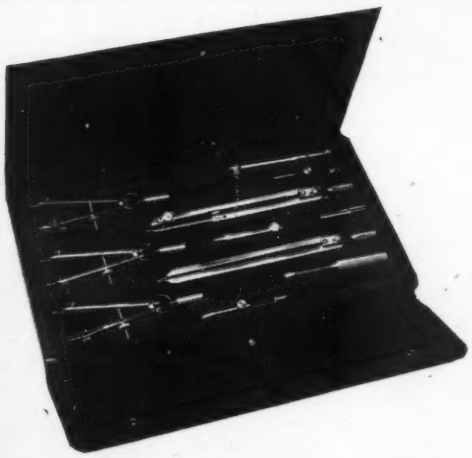

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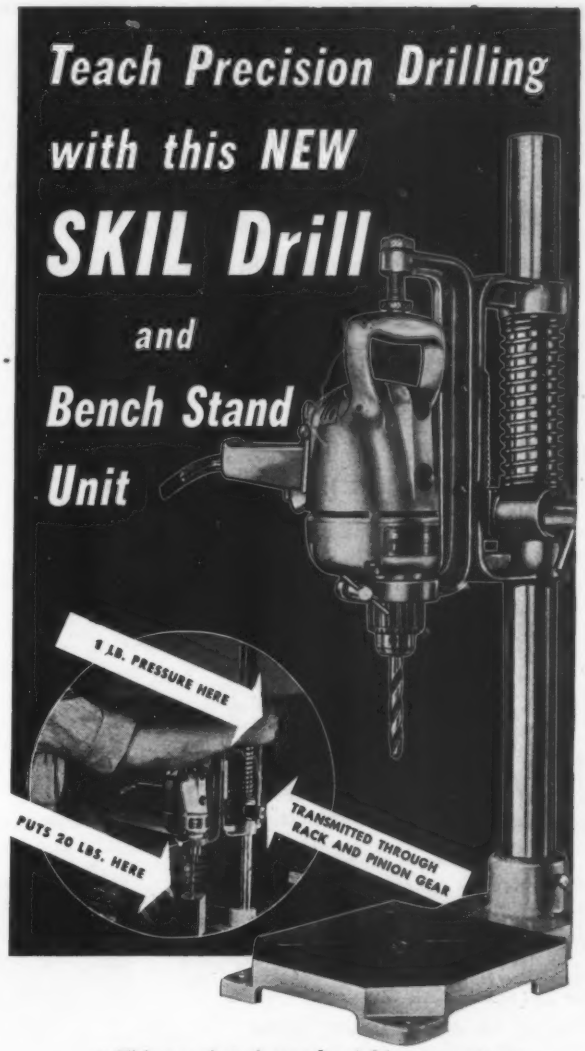

● This new bench stand quickly converts *any* portable electric SKIL Drill into a stationary drill press for precision drilling or hole saw work. Even with the standard short arm, the press delivers a 20 to 1 leverage ratio at the twist drill tip. A longer arm gives still higher pressure ratios. And, of course, the SKIL Drill can be removed in seconds for use anywhere in the shop. Call your SKIL Tool Distributor today for a demonstration at your school.

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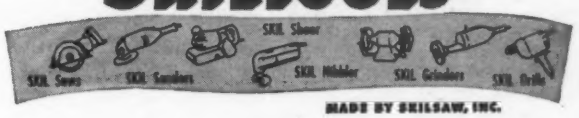

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(Continued from page 28A)

A miter gauge slot on the table is standard, while a rip fence can be added. A dust chute, attached to a dust collector, carries away dust and chips.

The saw has adjustable, ball-bearing guides, enabling the operator to make the finest micrometer adjustments.

For brief reference use IAVE—0202.

NEW A.C. INDUSTRIAL ARC WELDERS

A large illuminated current indicating scale is the dominant feature of a new line of industrial type a.c. transformer welders announced by The Hobart Brothers Co., Troy, Ohio. The scale is uniformly calibrated so that the extra large figures are evenly spaced from minimum to maximum welding heat settings, instead of crowded at one end and wide open at the other. The dial is illuminated by a 110-volt lamp, and is very easy to read from a distance in either light or dark locations. The light also acts as a telltale, indicating that the transformer is energized.

These welders are all of the moving coil type, i.e., both primary and secondary coils move when adjustment is made. The time required to make a given change in welding heat, therefore, is one third less than would be required if one coil remained stationary. Adjustment of current is made by means of a convenient knob on a pressed steel disk that serves as the drip proof top cover of the case.

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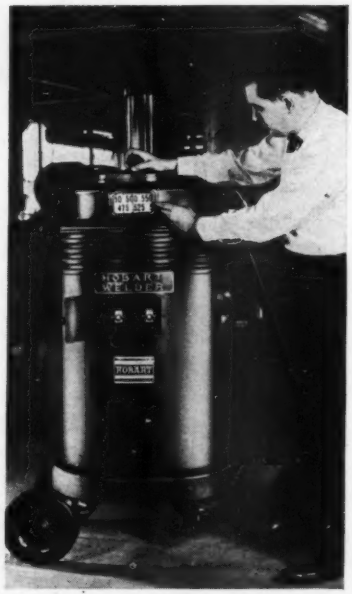

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For brief reference use IAVE—0203.

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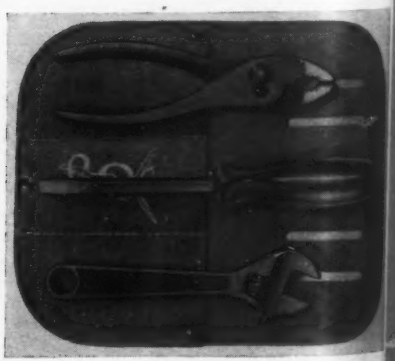
(Continued on page 33A)



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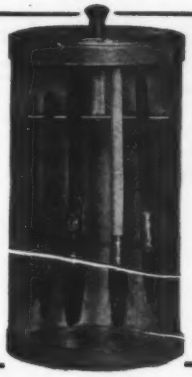

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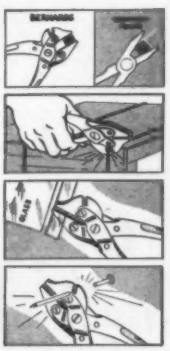

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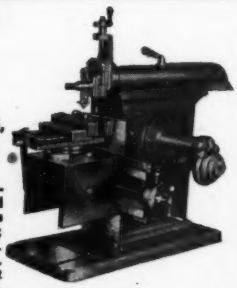

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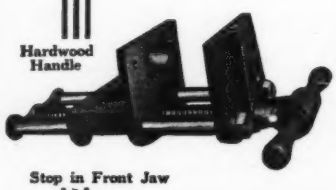

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(Continued from page 30A)

imprinted design. Four slots in the kit permit it to be carried on a belt, or to be hung most anywhere. The three pockets are wide enough to hold extra tools.

For further information write for catalog from the Plomb Tool Co., 2204 N. Santa Fe Ave., Los Angeles 54, Calif.

For brief reference use IAVE—0204.

NEW TRI-ARC WELDER

A new three-in-one unit which is portable and able to do welding, brazing, and soldering, is being marketed by M. R. Klein & Co., 27 E. Monroe St., Chicago, Ill.

New Tri-Arc welder

This versatile unit will weld steel, cast iron and its alloys, bronze and bronze alloys, nickel silver, copper, and nonferrous metals.

It is completely insulated against shock and is obtainable at a cost which puts it easily within the reach of the school shop.

For more specific description, address the firm mentioned in the foregoing.

For brief reference use IAVE—0205.

SOME INTERESTING BOOKLETS

The Technical and Service Publications Department of Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, has prepared two booklets entitled "Recommendations for Carbide Milling," M-1614; and "Recommendations for Grinding Carbide Milling Cutters," M-1608.

These booklets are well illustrated and contain the findings of the firm's research department, as well as the fruit of their experience gained in their own shops.

This firm also has on hand a limited supply of their "Show Booklet" which had been prepared for the 1947 Machine Tool Show held at Chicago.

The booklet contains illustrations of the complete Cincinnati products, each picture being accompanied by a brief specification.

Copies of these offerings may be obtained by writing to the firm.

For brief reference use IAVE—0206.

NEW REGAL T SQUARE

A new Regal T square has just been placed on the market by Engineering Manufacturing Co., Sheboygan, Wis.

This T square has a blade made of tan finished plastic, with transparent edges. The head is of black laminated plastic. The blade is securely fastened to the head with hardened steel drive pins. Blades from 18 to 60 in., varying by 6 in., can be obtained.

For brief reference use IAVE—0207.

REVISION OF "HOW TO RUN A LATHE"

The South Bend Lathe Works, 178 E. Madison St., South Bend, Ind., has just issued the 45th edition of their popular book, *How to Run a Lathe*. A number of changes in text material and

(Continued on next page)

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(Continued from previous page)

illustrations have been made since the previous edition was printed in 1944.

The book contains the latest information on the operation and care of metalworking lathes. It covers such subjects as the operation of lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling, reaming, tapping, cutting screw threads, reference tables, etc.

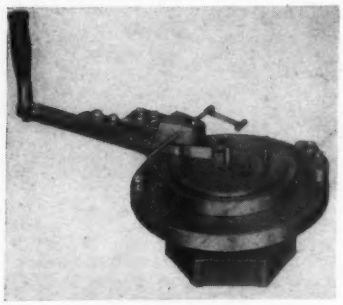
Written clearly and concisely, it is widely used by machinists and as a shop text in schools and apprentice-training courses.

The book is available with paper cover for 25 cents, or with leatherette cover for $1.

For brief reference use IAVE—0208.

DI-ACRO BENDER NO. 1A

The new Di-Acro Bender No. 1A is a multi-purpose bending machine which will form and duplicate an unlimited variety of parts and pieces on a production basis. It will also produce shapes and outlines impractical to obtain with other production dies.



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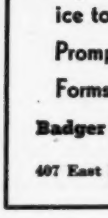
For further information address O'Neil-Irwin Mfg. Co., 351 — 8th Ave., Lake City, Minn.

For brief reference use IAVE—0209.



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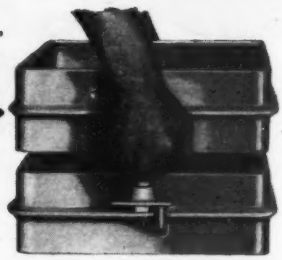

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